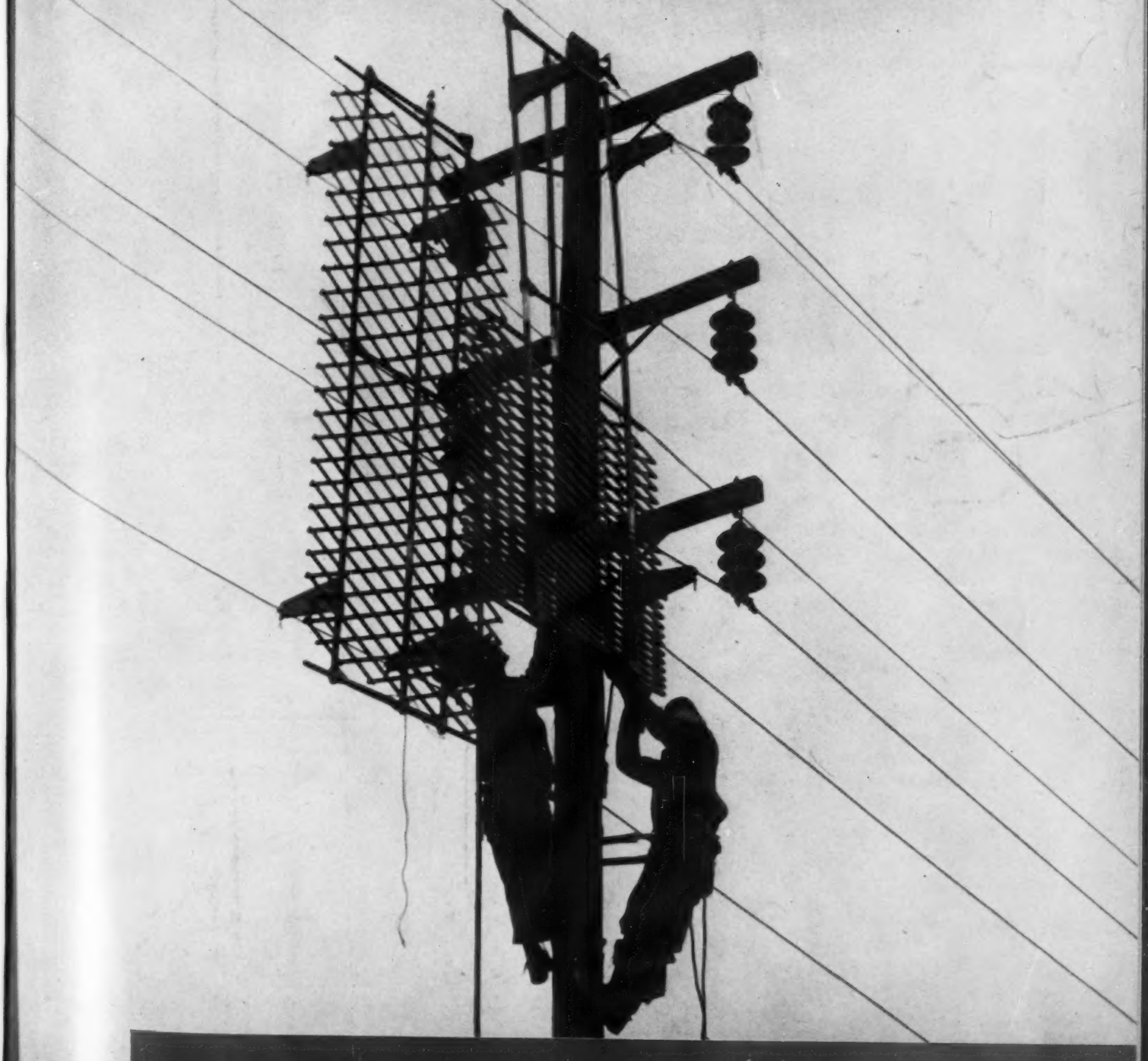
NOV 17 1941

Electrical World

NOVEMBER 15, 1941



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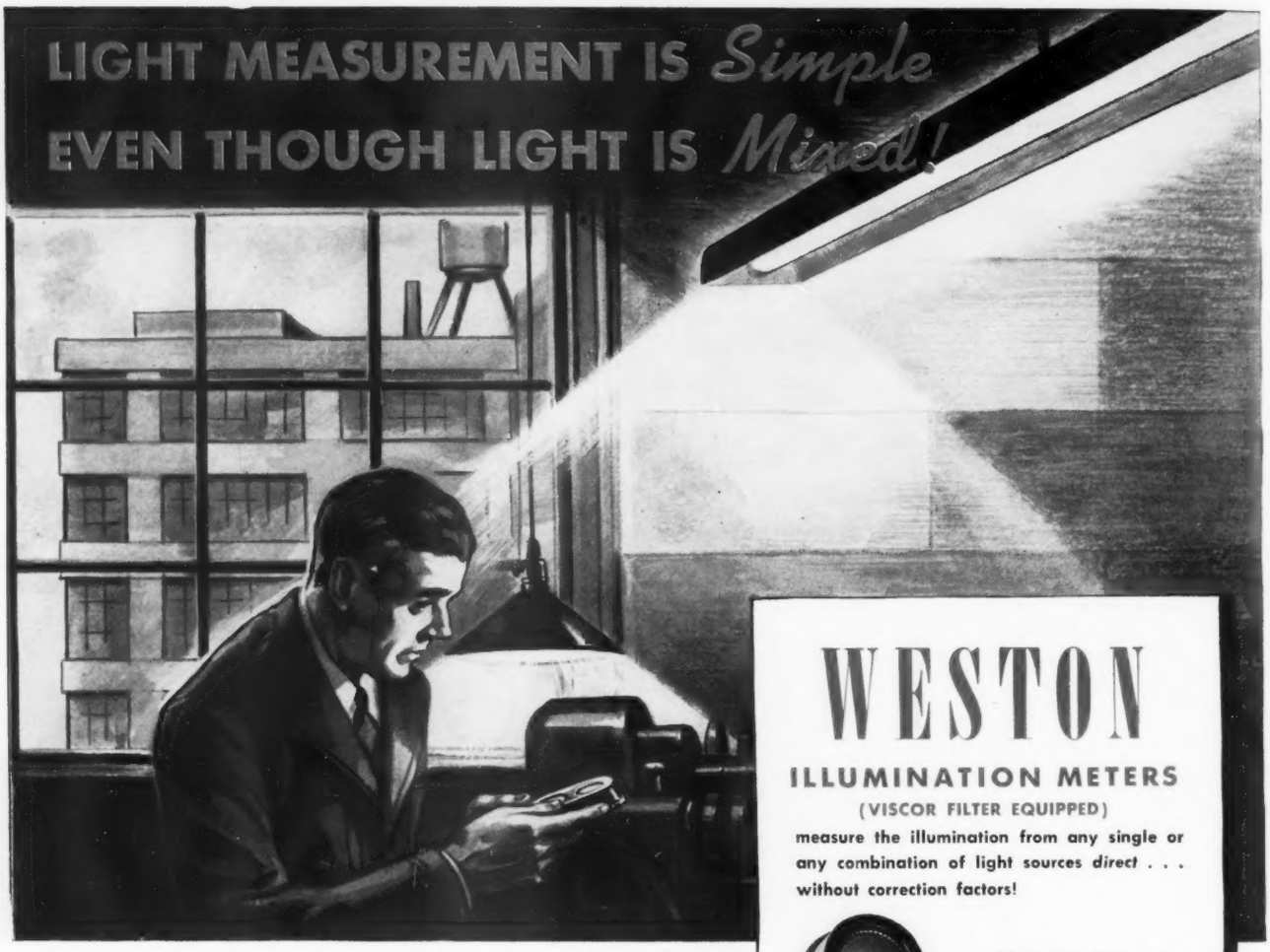

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November 15, 1941

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McGRAW-HILL PUBLISHING COMPANY, INC.
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Electrical World—Published weekly. Price 25 cents a copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42d Street, New York, N. Y. Subscription rates: In the United States, Mexico, Central and South American countries, $5 a year, $8 for two years, $10 for three years; Canada, $5.50 for one year, $9 for two years, $11 for three years (Canadian money at par). Great Britain and British possessions, 54 shillings for one year, 108 shillings for three years. All other countries $9 for one year, $18 for three years. Entered as second-class matter November 16, 1936, at Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Contents copyrighted, 1941, by McGraw-Hill Publishing Company, Inc. Branch Offices: 520 North Michigan Avenue, Chicago; 68 Post Street, San Francisco; Aldwych House, Aldwych, London, W. C. 2; Washington, Philadelphia, Cleveland, Detroit, St. Louis, Boston, Atlanta, Ga.

Publication Office
99-129 North Broadway, Albany, N. Y.

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330 West 42d Street, New York, N. Y.

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An Indefensible Attitude

Some people will never learn. There is a group of utility people, for instance, who won't be bothered with priorities. They say that over the years they have given their suppliers large amounts of business and that they expect to be taken care of now, regardless of the condition of the market. It is up to the suppliers to find the materials and to deliver when wanted.

This is an absolutely indefensible attitude for anybody, particularly a utility man, to take at this time. The utility industry has been proud of the manner in which it has contributed to national defense operations. Is it going to soil its fine record by a lesser cooperation with defense in the matter of priorities? Who are these men who are so much bigger than any one else that they can't be bothered with priorities?

The manufacturers are not responsible for the material shortages, nor are they responsible for the priority requirements. Why be so unfair, then, as to put the burden on them? The manufacturers can get raw materials only on that part of their business definitely accountable as defense. In other words, without priorities the manufacturer cannot furnish equipment made out of material that must be accounted for. No tickee, no washee.

If a utility needs equipment for essential defense construction OPM will issue a priority. If there is no such need no priority can be had, nor should the construction be made. If there are utilities that are selfish enough to try to get scarce materials, either for non-defense construction or for further increasing an already sufficient inventory, they should be censured.

Such action merely invites Congressional investigation, more bad publicity for all utilities and, finally, restriction on all construction without a permit, whether the materials are on hand or not. Wouldn't that be just dandy?

One of the worst situations lies in the overstuffed inventory. To use this material for non-defense construction, as has been mentioned, is simply to invite trouble. REA would like to get a few such examples and with them insist that it, too, be given equipment to build non-defense lines. It would seem, therefore, to be a matter of good policy to share an overstock with others who need the equipment and in that way get back in line.

Every time the industry has got in trouble it has been because a few smart fellows took the attitude that they were sacrosanct. This must not be allowed to happen again.

Utility people who by this time haven't learned what happens to nonconformists can expect no sympathy from their fellow utility men, from their suppliers, from their customers, or from regulation. The man who bites off his nose to spite his face generally deserves the punishment he gets.

Big Turbine Requires Only Minor Overhaul

Stellite strips on low-pressure stages, auxiliaries maintenance, buckets Magnafluxed for cracks, couplings found excellent, no remachining of H.P. cover after six years and 5,000,000,000 kw.-hr.

W. F. OBERHUBER, Philadelphia Electric Company*

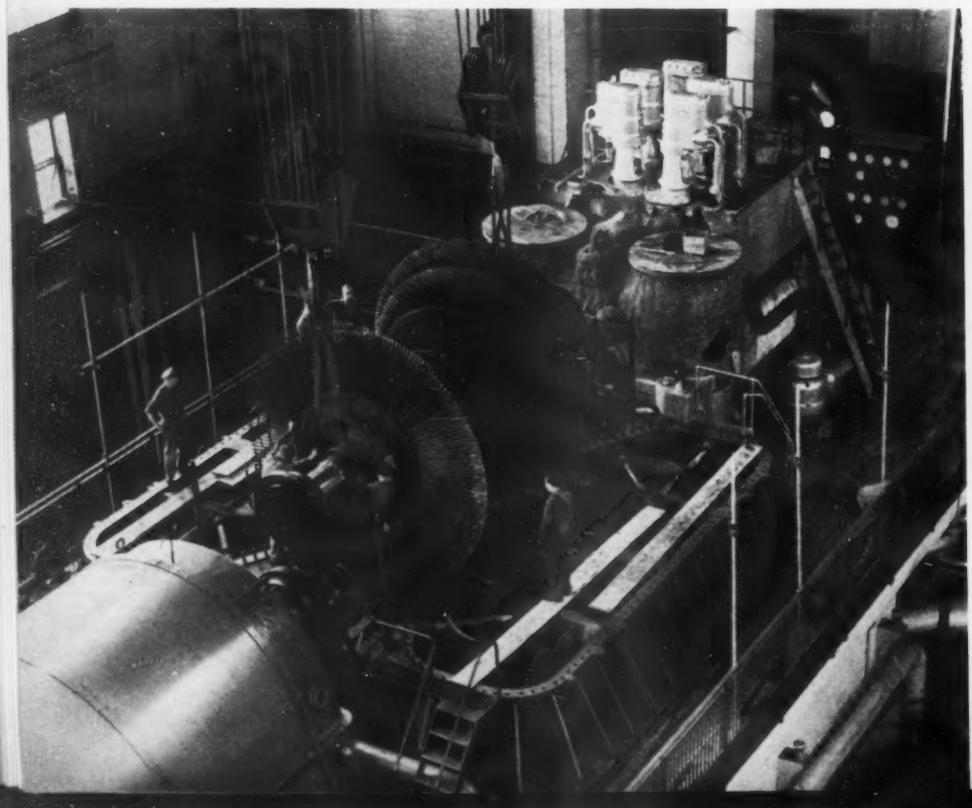
GRATIFYINGLY small maintenance was found necessary on recent periodic inspection of the 165,000-kw. turbine at Richmond station. Since it went into service on August 6, 1935, the unit had turned out 5,091,994,000 kw.-hr. Total maintenance expenditures have amounted to only $20,427. The unit is a Westinghouse tandem-compound, operating at 1,800 r.p.m., 375 psi. and 825 deg. F. Boiler capacity available has limited the loading to 135,000 kw.

In addition to customary minor adjustments and renovation the principal repairs were the welding on of Stellite strips to blade edges in the low-pressure stages. No remachining of the high-pressure cover was necessary and the Fast couplings were found in excellent condition.

Before this unit was removed from service a detailed list of contemplated work was prepared and arrangements made for necessary material, men and length of outage. Work was started April 1, 1941, and was completed April 30, 1941. With this list in the hands of each of the supervisors it was possible to coordinate all the work in such a way that details were all rounded up and completed at the time the major item of repair was completed.

Not since the machine was originally put in operation has the high-pressure cover been lifted. In the opinion of the manufacturer, the great size of the casting, in conjunction with the operating temperature of 825 deg., would require considerable time for proper seasoning and, therefore, recommended that the casing should not be removed until the growth of the casting warranted machining. To date there has been no definite indication that the work is required. Therefore, all maintenance work on the unit has been confined to all other parts of the turbine, excepting the high-pressure cylinder.

LOW-PRESSURE ELEMENT of 375-psi., 165,000-kw. unit being removed



Stellite Strips

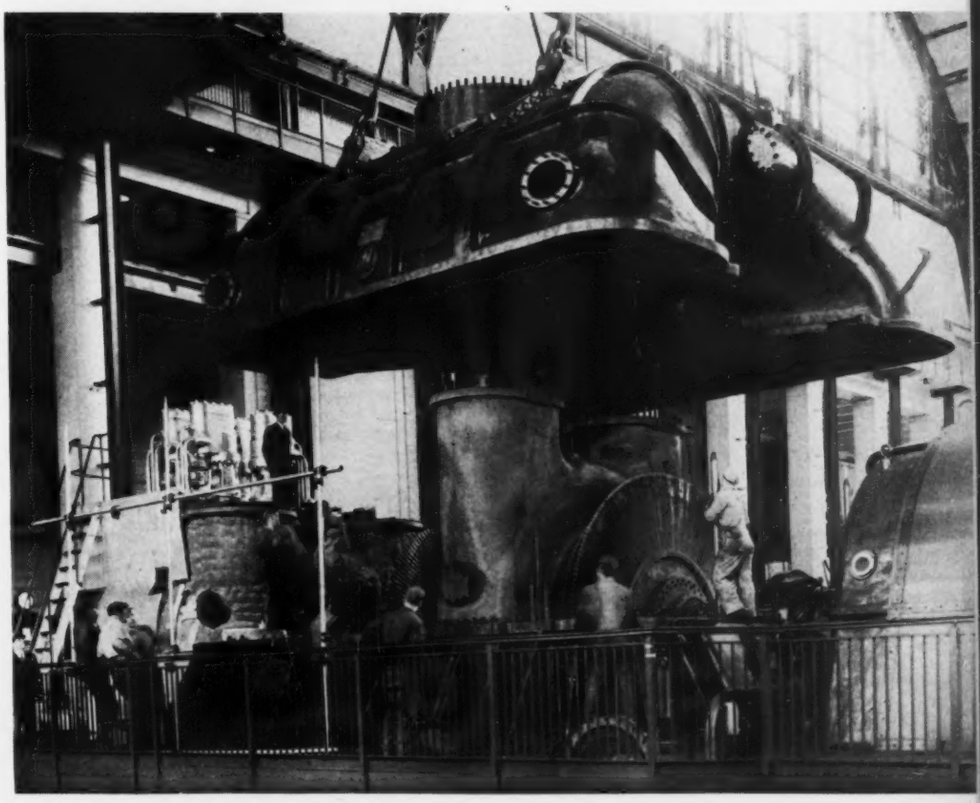
The 1941 inspection, which has just been completed, was planned from results and observations made during the previous inspection performed in 1940. It is our usual practice to plan the next scheduled inspection by observations and indications of previous inspections. When the turbine was opened, in 1940, erosion of the blades in the last two stages indicated the necessity of replacing the Stellite strips on the eighth stage, and the installation of new Stellite strips on the seventh stage blades, both in the low-pressure cylinder. All parts of the turbine, generator and auxiliaries were inspected, excepting the high-pressure cylinder casing, nor was it deemed necessary to remove the field. The inspection of the unit proceeded on a three-shift, 24-hour schedule.

When the low-pressure rotor was removed for installation of the Stellite strips, an inspection of the blading disclosed two blades in the eighth

* Superintendent station operating maintenance division.

stage wheel, turbine end, cracked about two-thirds across the blades, just above the root. The manufacturer, however, had material on hand and on short order, and without delaying the progress of the work, supplied two new blades. All buckets in the rotor were then Magnafluxed to determine if other cracks existed. No other faults requiring blade replacements were found. Ten small cracks were found in the center of the blade tips adjacent to the lacing welds, but not extending through the blade, nor to the edge of the blade, which were treated by drilling the crack terminals with $\frac{1}{8}$-in. drill and silver soldering. The Stelliting of the two stages, which consisted of four wheels and a total of 766 blades, was completed in eighteen days. All blades were again Magnafluxed to determine if the welding had caused any new cracks.

STELLITE FACING STRIPS welded to pitted rotor blades in seventh and eighth stages, low-pressure element



UPPER HALF of outer casing of maintenanced low-pressure element goes back into place

All Parts Examined

General inspection consisted of examination of all essential parts of the main unit and auxiliaries. All the turbine bearings and thrust bearings were inspected and found to be in good operating condition with proper clearance. One throttle valve and all valve gear were dismantled and examined and minor replacements and adjustments made. The copper expansion pieces on the crossover piping were removed and annealed. One expansion joint showed a crack which was repaired, but a new joint will be ordered for installation at the next inspection.

The Fast coupling was inspected by our forces and the manufacturer and found to be in excellent condition. All glands were inspected and the gland runner of No. 4 seal replaced from stock because of water cutting. All gage piping under the turbine was renewed. Both atmospheric relief valves were inspected, cleaned and adjusted. The main and auxiliary oil pumps and the two Aroclor pumps were dismantled, necessary replacements made such as bearings and tightening of the pump rotors. Both circulating pumps showed considerable wear on the impellers, which, after dressing, were returned to service and are now operating satisfactorily. New impellers have been ordered for installation at the next regular inspection. On the inspection of the condensate pumps, the aluminum impeller on one hydraulic coupling was found to have nine vanes cracked. These were successfully welded, the impeller rebalanced and returned to service.

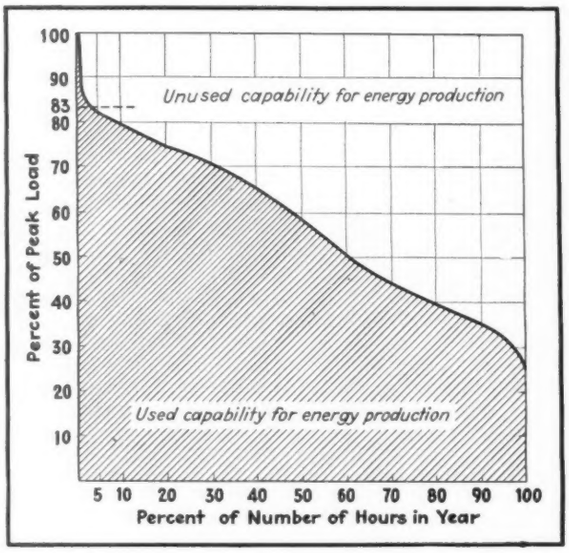
Oil coolers were cleaned, by-passes installed around the inlet water valve to give finer regulation. The main condenser was cleaned and the condenser steam space then filled with condensate to check the tightness of the condenser. All other auxiliary equipment was examined and all copper expansion joints removed, annealed and reinstalled.

Vast Power Resource Lies Unused

Millions of kilowatts in equipment already installed in existing power stations wait for load, while new plants making heavy demands on scarce materials are projected

FRANK R. INNES, Managing Editor

WHILE utilities, manufacturers and government strain to increase the power production capacity of the nation, a vast reservoir of electricity stands unused. This quantity of power is to be reckoned in millions of kilowatts, perhaps as much as five millions, energy amounting to 30 or 40 billion kilowatt-hours per year, enough to produce aluminum for thousands and thousands of bomber, fighter and trainer planes. This power should be used. It should be employed to defer, if not largely to prevent, huge new investments in additional capacity. Its employment will avoid demands for unneeded machinery and equipments on electrical and other manufacturers already fully occupied in defense production. Its use will save great quantities of scarce metals and other materials, as well as thousands of hours of skilled manpower. In fact, the installation of one unneeded generating unit might easily prevent the building of 100 tanks.



USED and unused energy production capabilities

The characteristic shape of the load duration curve results from the habits of use of electricity. For many years utilities have striven to flatten out the curve by encouraging growth of "valley" loads and by offering rate inducements to coax users to "stay off the peak." But the utility must supply electricity when the customer wants it and must adapt operations to customers' demands. Hence a large amount of capacity, as represented by the steep, almost vertical, portion of the curve at the left, is used only a few hours in the year.

The Evidence

This power resource lies in the hundreds of power plants up and down the nation. It is comprised of so-called "off-peak" power, much of it realizable as firm power from not too radical revision of working habits in industry, such as staggering and overlapping of working hours and days. Present data are sufficient to justify the assertion that the amount of this idle power capacity is much too large to be neglected, most particularly not to be neglected at this time when every kilowatt and kilowatt-hour are so urgently needed.

The quickest picture of the availability of off-peak power is that of a "load duration" curve. Such a curve, a composite graph erected on information from eight large electric utilities, appears on this page. The points on which the curve is plotted are the arithmetical sums of hourly loads on these utility systems in 1940 arranged in descending order from the highest to the lowest hour. The curve shows the percentages of hours in the year during which percentages of loads above any given amount were carried on the eight systems. The utilities represented in the curve had an aggregate peak load in 1940 of approximately 6,600,000 kw., more than 20 percent of the 1940 estimated aggregate peak of 31,500,000 kw. for all the electric utilities in the country. This curve may fairly be taken as representative of the total load on utility power stations in this country.

Short Hour Use

The curve says that for only 20 percent of the time is 75 percent or more of the peak load carried; that for only 10 percent of the time is 80 percent or more carried; that for only 5 percent of the time is 83 percent or more carried. In other words, generating capacity required to carry 25 percent of the peak load is used only 1,752 hours out of the 8,760 in a year; capacity for 20 percent is used only 876 hours; capacity for 17 percent is used only 438 hours and is idle for 8,322 hours. On the basis,

then, of 31,500,000 kw. total load, the generating capacity required to carry that part of the load which constitutes the thin, sharp point of 17 percent last above mentioned amounted in 1940 to 5,200,000 kw. which was used only 5 percent of the time and was idle 95 percent.

On the statistical evidence of the curve, taken by itself, the electric utilities had in 1940 some 5,000,000 kw. of capacity which was unused 95 percent of the time. (Total load in 1941 is higher than in 1940. Total capacity is also higher. Load factor is higher, too, and thus the shape of the load duration curve for 1941 will be somewhat changed from that of 1940 shown here. But it is not conceivable that the change will be so great as to weaken appreciably the claim of power availability here asserted.)

The evidence of the load duration curve cannot be taken by itself. Consideration must be given to important conditions that do not appear in the curve.

Water and Fuel Power

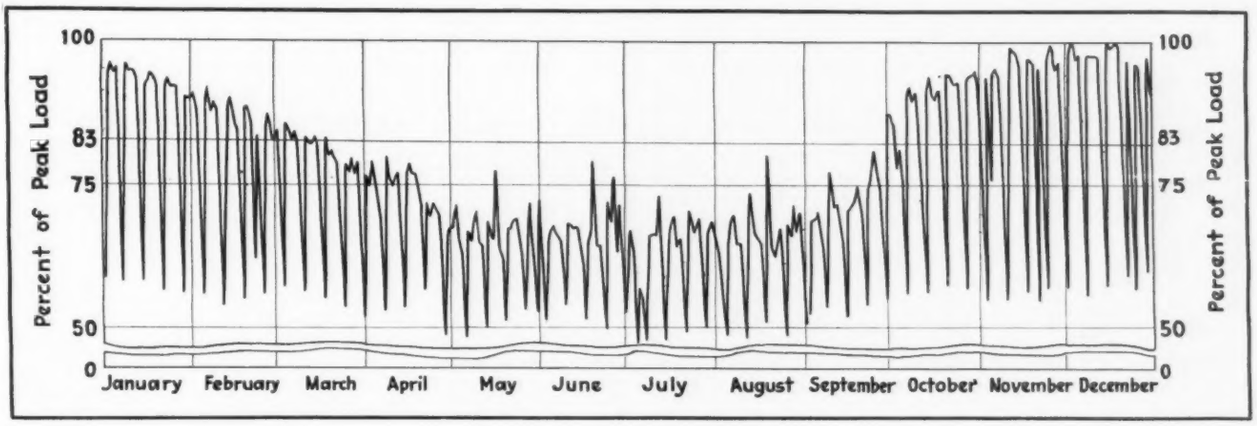
The first thing to be considered in modification of any national estimate of off-peak power availability is the division of prime movers between water and fuel power. In some systems the production of electricity is entirely by fuel power (predominantly steam power, and thus designated in this discussion); in others production is by steam and water power together; in some by water power alone, although these are few and small.

Fuel and water may be regarded as the raw materials of electricity. For a steam power plant it may be assumed that the raw material can be obtained to keep the plant running continuously at full load. This assumption cannot be made as regards a water power plant. It may or it may not have enough water to run continuously at full load. If it has not, then we cannot include its capacity in the total from which the estimate of available capacity is derived. But there are some water power plants, those at Niagara Falls for instance, that do have water for continuous operation and these can be included. About one-quarter of the installed generating capacity in this country is in water power and only a part of it is capable of continuous full-load operation. This condition will reduce any estimate of off-peak capacity based on the load duration curve.

A further reduction will result from the necessity for maintenance and care that attaches to all structures and machines.

In its basic mechanical elements the steam turbo-generator is a marvel of simplicity. But even such a mechanical paragon as this cannot run without wear. It must be taken out of service at intervals for inspection, maintenance or overhaul. These intervals of shutdown are usually widely spaced; one hears of steam turbo-generators running for two or even three years continuously. But such performance is exceptional. Most utilities have regular and rigidly observed schedules of shutdown for their machines for inspection and so that necessary care can be given to them. These schedules are variable among utilities according to size, make, type, age and character of loading of different machines and according to what the operators consider to be good practice.

It is the general custom to schedule these routine shutdowns for the summer months; that is, in the valley of the annual curve of daily load peaks (refer to the second graph, which will have more discussion later), thus reducing total operable capacity during the "season" of maintenance and overhaul. How much the reduction may be in a given case is determinable only by the circumstances of that case. The reduction may be larger or smaller from one year to the next, particularly in the case of a smaller system with only one or two machines of comparatively high rating. Of the larger systems with more big machines it may be said that the reduction in operable capacity in the warmer months caused by routine shutdowns remains pretty steadily from year to year in the neighborhood of 10 percent of total capacity.



THE seasonal valley of peak loads

Boiler Maintenance

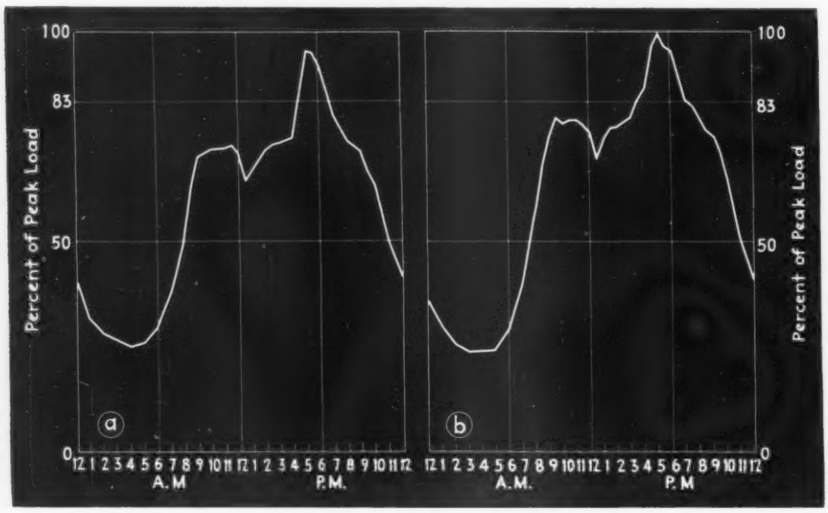
Boilers and auxiliary equipment require attention as well as turbo-generators. In fact, the probability of need for emergency maintenance on boilers is greater than on turbines. Recognizing this condition, it is customary to provide a surplus of station boiler capacity of 10 percent or so over what is actually required for full-load turbine operation.* With

* Exceptions to be noted are the numerous modern "single-unit" high-pressure installations, each consisting of one turbo-generator and one boiler. But the availability of such installations is usually very high, an outstanding example being the Port Washington station of the Wisconsin Electric Power Company. The record for five years operation of this station, published in "Electrical World" August 9, 1941, states that the installation had an availability of 90 percent for the five-year period.

the usual surplus of boiler capacity as a protection against emergency it is possible to schedule routine boiler maintenance to coincide with turbo-generator maintenance.

Further in regard to boilers it should be noted that they are rated in terms of time; that is, the full-load rating for a short time is greater than it would be for a longer time. If load were added in appreciable amount, thus forcing boilers to operate at high steam output for longer hours, boiler ratings would have to be reduced. This necessity would cut into off-peak power availability.

The availability of auxiliary equipment is not generally an important determinant, because in most plants the provisions of spares and the possibilities of interchangeability make this consideration a very flexible one.



DAILY LOAD CURVES in November (a) and December (b)

Power Factor

Another condition that in some cases may be of certain importance is the fact that winter peaks include a larger proportion of lighting load than do the summer peaks. In summer the peak load power factor is lower. This condition has no bearing on boiler operation, but it does affect generators and other electrical elements in that the temperature rises on them do not decline from winter to summer as much as do the power loads.

Without extensive study of conditions on individual systems it is practically impossible to arrive at any idea of how much an estimate of available off-peak capacity taken from a load duration curve should be reduced by consideration of the water power element, by the necessities for derating boilers and for maintenance and overhaul and by lower summer power factor. Also, if turbo-generators, boilers and associated equipment are used for longer hours, as will be required by employment of the available capacity here asserted, the matter of maintenance will take on greater weight. But these operational necessities do not by any means cancel out all of the apparently available off-peak power shown by the load duration curve. There will be left an amount far too large to let stand idle, particularly now.

Having established the fact of its existence, let us now consider how this off-peak power resource may be used, the conditions of its availability. For convenience of statement, let us return to 1940 data.

For 5 percent of the year, 438 hours, peak-load capacity is used to carry peak loads. For 95 percent of the year, 8,322 hours, it is available for other loads. This is what the load duration curve says. But it does not say several other things which are important. For these other things let us consult some other curves, those in the second and third graphs that accompany this article.

The second graph is the curve of daily peak loads for 1940 of a large utility system. It shows that the 438 hours of use of peak capacity are not continuous, but scattered. The horizontal line of 83 percent across the curve shows that some or all of the peak capacity, defined as 17 percent of peak load, was in use on this system about 120 days in the year. And these 120 days are distributed generally in blocks of five per week for about 25 weeks in the months of January, February, March, October, November and December.

In the Colder Months

From the evidence of this second graph it appears, then, that the 5,000,000 kw. of apparently available capacity indicated by the load duration curve is not available during the six colder months of the year. But this conclusion misses being correct on account of another condition which is illustrated by the companion curves of the third graph. These show the hourly variations for two days, one in November and one in December, in load on the system from which the curve of daily peaks (the second graph) was obtained. The December day is the one on which occurred the highest peak load of the year. On this day the peak capacity of 17 percent was in use for about four hours as indicated by the horizontal line. On the November day the peak capacity, not all of it, though, was in use for less than 2½ hours. Thus it is seen that for the days on which peak capacity is in use both the amount and duration of use vary from day to day. This means that all of the 17 percent peak capacity is available on each of the 120 days for from 20 to 22 hours, and that some of it, much or little, is available during the two to four hours of peak load themselves. The conditions shown by these two graphs refer to one utility and are not offered as typical of the whole industry. Yet they do illustrate the points made.

How Much and Where

Companion in importance to the times of availability of off-peak power are the quantities of its availability. Application of the 17 percent ratio to published data on peak loads will give some idea of these quantities. Such data are found in the tabulation of loads, outputs and installed capacities for some 160 major systems in the United States, published as a supplement to ELECTRICAL WORLD, May 3, 1941. From this and from general knowledge of utility system conditions, it appears

that off-peak power should be available in blocks as large as 100,000 kw. or more and as small as a user might want. Conditions within systems would be the determinants. One system might have 100,000 kw. available, not all in one block at one place, but in different quantities at different places, depending on sizes and locations of generating plants, on transmission lines and on substation capacities.

Summing Up

From the three graphs and from consideration of associated conditions we have adduced these conclusions:

1. That the electric utilities have available in their plants generating capacity able to carry an additional load that may be reckoned in millions of kilowatts.

2. That this power is continuously available during some months of the year and is in large part available during other months.

3. That the periods of partial or zero availability during the other months are not long, not more than a few hours in any day.

The employment of this vast resource of power is not a simple matter. It is a problem that must be dealt with in relation to the normal habits of power use in industry established by years of custom. Probably a calculated change in habits of use would enlarge the resource, making it considerably more than has been indicated in this discussion. Staggering of work hours and overlapping of working days to eliminate the unproductive week-end are expedients to reduce the sharp peak of load. These changes would transform into firm power much of the capacity here referred to as off-peak and would add to its quantity.

The problem is not capable of offhand solution in total terms. To put this idle power to work is a task that will require much study of equipment availability in individual systems, much study of the load requirements of users of power. It will require radical revision of habits of operation in electric utilities and revision as well in the habits of electricity use.

The uses to which this available power might be put are the ordinary uses of power in industry. One thinks, naturally, of the demands for

[*Continued on page 124*]

Can Off-Peak Power Be Used in Chemical Industries?

In some electrochemical processes power outages will present small difficulty; in others, revisions of operations or apparatus may remove dependency on continuous power

COLIN G. FINK, Professor of Electrochemistry, Columbia University

THE present world war has again very emphatically emphasized that success in arms means success in metals. Without abundant supplies of metals, such as aluminum, magnesium, chromium, copper and tungsten, modern warfare would be impossible. Immediately upon the initiation of our country's defense program demands for strategic metals well-nigh doubled over night. No air planes without aluminum and magnesium; no battleships without chromium, and no high-speed machine shop production without tungsten tools. And most of the strategic metals are utterly dependent upon electric power. Thus, a ton of electrolytic copper requires 2,800 kw.-hr., a ton of magnesium 20,000 kw.-hr., and a ton of aluminum 24,000 kw.-hr.

In the article "Vast Power Resource Lies Unused," by Frank R. Innes, it is stated that capacity now installed in electric utility plants is capable of taking on additional load to be reckoned in millions of kilowatts. Mr. Innes starts out bravely by talking about 5,000,000 kw. of available capacity and then he recites a number of considerations, the effect of which will be to reduce the original estimate by some indeterminate amount. No indication is given as to what the reduction may be, whether a quarter, a half, two-thirds, or what. Simply to have a definite figure in considering how this power might be used in the electrochemical process industries, suppose we assume that the necessary reductions will bring it down to as low as 1,000,000 kw. This is still a lot of power. What does 1,000,000 kw. mean in terms of aluminum, magnesium, alloy steel, chlorine and other electrochemical products?

Before answering that question we must consider how, where and in what quantities the power is available. Except as more or less of it may be made so by control of existing loads, this power is not continuous. It is described as being available for 95 percent of the hours in the year, its periods of complete or partial unavailability being scattered in lengths up to four hours or so per day during the colder months of the year. It is dispersed all over the country in quantities ranging from 100,000 kw. or more down to as small as any user might want. Do these limiting conditions rule out this power for use in electrochemical processes? I do not think they do, not at all to such degree as to justify ignoring its availability.

Magnesium

A typical electrochemical product, and one that has been very much in the limelight during the past year, is magnesium metal. And although this country's yearly production has skyrocketed during recent years (1,500 tons in 1935; 15,000 tons in 1941), the demands of the defense program are increasing every month, so that the U. S. production for the coming year will be more than double that for this year.

Magnesium metal is produced by the electrolysis of fused magnesium chloride (700 deg. C.). The operation is a continuous one, 24 hours a day. As magnesium metal is withdrawn, fresh magnesium chloride is added to

[*Continued on page 124*]

POWER increment of 27,000 kva. at Glenville promises 12,000,000 additional pounds of aluminum production. Dam, 3½ miles upstream, impounds 1,470-acre lake on west fork of Tuckasegee River in Great Smokies of North Carolina. The penstock has been completed and covered. The 1,215-ft. head is the highest in eastern U. S.

Hydro for Aluminum Highest Head in East

Glenville (1,215 feet) and Nantahala (1,005 feet) designed to firm the capacity of Aluminum Company's run-of-stream plants on Little Tennessee and tributaries

J. ELMER HOUSLEY, Aluminum Company of America, Alcoa, Tenn.

TWO NEW hydro plants will firm up the capacity of three existing run-of-stream hydro-electric plants (Santeetlah, Cheoah and Calderwood) of the Aluminum Company of America on the Little Tennessee River. Glenville, a high-head, storage-type plant, came into service in October and Nantahala will be operating soon thereafter, the two adding 90,000 hp. Nantahala's Francis-type reaction turbine of 60,000 hp. will be the first reaction turbine to be applied to a rated head as high as 925 ft. (maximum gross head, 1005.5 ft.).

Impulse wheels have been exclusively used at this head in the past. However, the history of the use of reaction wheels indicates a tendency gradually to extend the upper limit of head at which these wheels are used and in a broad sense is comparable with any advance in the art. The controlling elements in the case of the Nantahala wheels were simply that a better efficiency, several percent better, could be realized and a very large decrease in cost of the power house and penstocks could be expected than by applying impulse wheels.

Rock Dams

Glenville Dam is of rock and earth-fill construction and its maximum height is 150 ft. Water is conducted from the dam to the power house through two unlined tunnels and one steel-lined tunnel, with three short runs of steel pipe in the open. Part of the steel pipe is 8 ft. in diameter and part of it is 6 ft. in diameter. Total length of the water conduit is 16,313 ft. The penstock divides into two parts just above the power house and each leg has a 36-in. gate valve immediately ahead of the respective turbine needle valves. Reservoir storage capacity, 68,000 acre-feet, is large relative to the drainage area and, therefore, the river may be absolutely controlled.

Nantahala Dam is to be of rock and rock-fill construction with a maximum height of 250 ft. There will be 29,471 ft. of pressure conduit to carry the water to the power house, 1,820 ft. being steel pipe in the open, one 18,706 ft. section of unlined tunnel and another section of tunnel 8,922 ft. long. Maximum drawdown of 130 ft. gives a storage of 130,000 acre-feet. Station controls and auxiliary equipment will be similar to that on the Glenville power house.

Impulse Wheels

Maximum gross head at Glenville is 1,215 ft. The one generating unit consists of an Allis-Chalmers generator (27,000 kva. at 0.8 p.f., 257 r.p.m., 6.6 kv.) coupled directly to two Allis-Chalmers impulse wheels rated at 15,000 hp. each under an 1,150-ft. head.

Main power transformer is made up of three single-phase, 9,000-kva. transformers connected delta on the 6.6-kv. side and wye on the 154-kv. side. A fourth transformer is carried as a spare. A Leeds & Northrup temperature recorder, with high temperature alarm circuit, provides a continuous record of transformer temperature. Manually operated taps on the transformers can provide transmission voltages over an operating range of 150 kv. to 168 kv. as required to maintain flat voltages at Alcoa.

A Leeds & Northrup automatic frequency load control equipment has been provided to coordinate the operation of the plant with the interconnected power systems. Flat tie-line control, tie-line, load-bias control, selective frequency control or flat frequency control may be employed as operating conditions dictate.

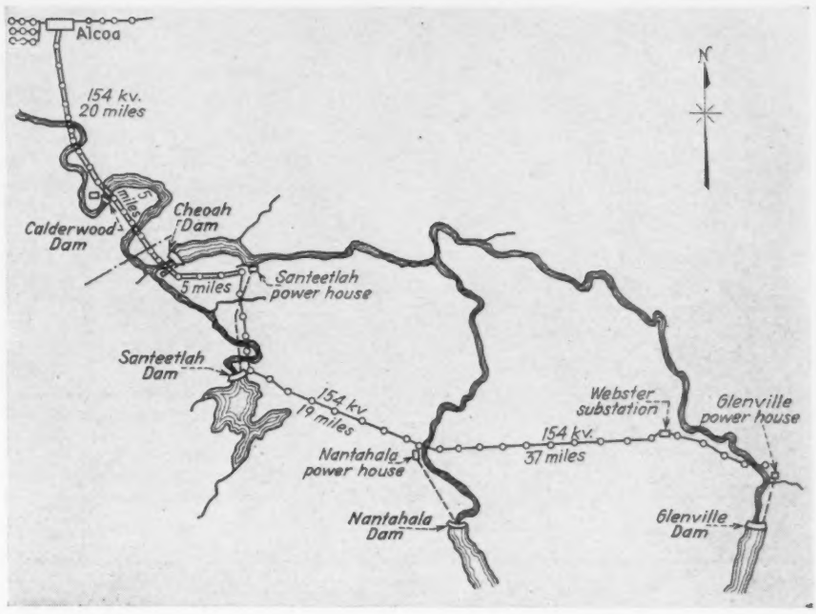
Indications of power flowing over the tie line at Alcoa will be transmit-

ted to the Glenville plant by means of carrier telemetering equipment. This equipment will be so coordinated with the other load control equipment on the system that the maximum efficiency of regulation of tie-line loading and frequency may be obtained. During the shifting of large blocks of load all plants will take care of a proportionate part of the generation in order to maintain the proper tie-line loading at designated points of interconnection with other systems.

Carrier Relaying

High-speed carrier pilot wire relays will be provided for protection on two sections of the transmission lines between Santeetlah and Nantahala and Nantahala and Glenville. Carrier communication facilities will be available from Glenville and Nantahala power houses to the Alcoa load-dispatching center. Additional communication facilities are supplied by the Bell system east through Sylva, North Carolina, and west through Murphy, North Carolina.

For the control of the plant the main switchboard is of the latest cubicle design and provides efficient control of all equipment. Usual automatic alarms on bearings, generator windings and transformers are provided. Station auxiliary equipment operates at 440 volts alternating current. No direct-current auxiliary equipment is used, thus eliminating the overloading of storage battery equipment in case of complete power failure. Emergency power supply to the auxiliaries will be provided by a Diesel-engine-driven generator.

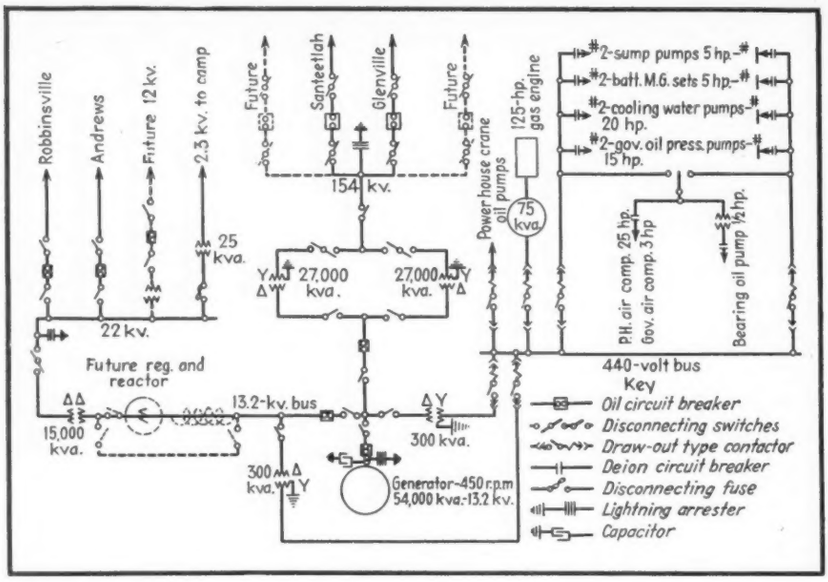


TRANSMISSION at 154 kv. ties two additional hydro developments on Little Tennessee system with Santeetlah-Cheoah-Calderwood group for aluminum production at Alcoa

Transmission for the 19 miles between Nantahala and Santeetlah is of steel tower construction with three conductors, 636,000-cir.mil aluminum cable, steel reinforced. The conductors are arranged in a horizontal plane with 23-ft. spacing between each outside conductor and the center conductor. Two $\frac{7}{16}$-in. galvanized steel ground wires, 33 ft. 9 in. horizontal spacing, are located 22 ft. above the conductors. Both phase and ground wires are symmetrical with respect to the center line of the towers.

Transmission (37 miles) between Glenville and Nantahala is of wood H-frame construction. Three 397,000-

GLENVILLE DAM has main crest length of 900 ft., greatest width 830 ft. In right foreground are fuse-plug dams in the spillway, auxiliary saddle dam, 410 ft., in left background



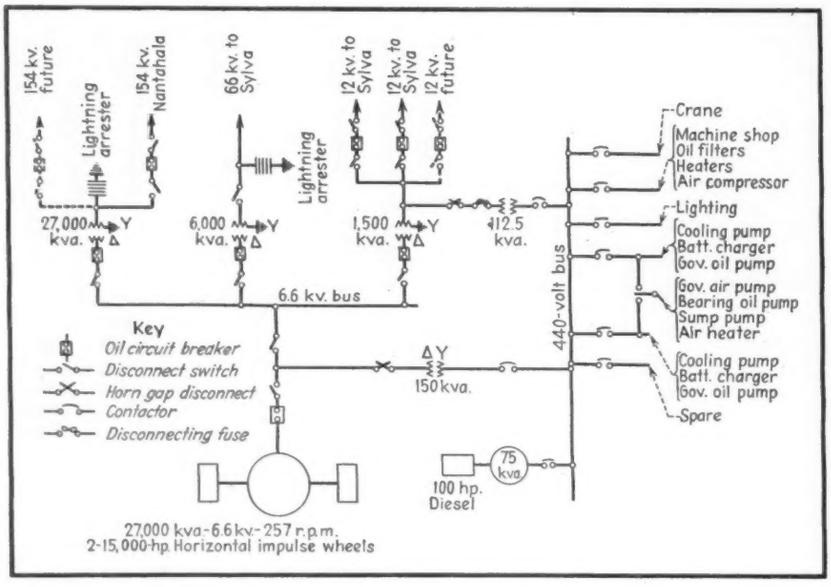
POWER HOUSE BUS and auxiliary pattern at Glenville

cir.mil steel-reinforced aluminum cables are arranged with 17-ft. horizontal spacing. Eleven miles of this section of line, running from the Webster substation to the Glenville power house, is provided with two ground wires. The ground wires are ⅜-in. galvanized steel, spaced 18 ft. apart in a horizontal plane 15 ft. above the conductors. Two thousand feet of this type of ground wire construction is provided at the Nantahala end of the line.

A special double-primary low-saturating type current transformer in each main lead and its neutral furnish differential current protection for the generator through a high-speed PJC differential relay. A second special low-saturating type current transformer in the common generator neutral provides phase to ground protection through an instantaneous non-directional PJC ground relay for all the 6,600-volt bus work, cables and low-tension windings of the power transformers. By using these low-saturating type current transformers the maximum secondary current is limited to a low value, and consequently during a severe fault condition protection is provided without the risk of burning out relay coils, as this transformer avoids the imposition of heavy currents through the relay. It has been found that extremely low fault currents are quickly detected with this type of current transformer. Arcs, which have been started by accidental contact with generator leads, have been extinguished before developing into a three-phase short circuit, thus eliminating large consequential damage which previously resulted from failure of bus insulators or other conductor insulation. Generator protection from current demand faults is provided by a three-element induction, inverse time IAC over-current relay.

Power transformers are protected by a three-element induction, inverse-time IAC overcurrent relay. Transformer ground protection is provided by a single-element directional ground ICC instantaneous relay. In addition to this, a PJC high-speed relay receiving current through a case grounded current transformer is provided. Gas pressure relays are installed on each transformer for protection against internal faults which create a rapid evolution of gas.

The high-voltage, 154-kv. bus is protected against phase-to-ground faults by a PJC differential non-directional ground relay operating on a current flow between the common of the line overload relays and the transformer neutral ground relay.



ONE-LINE DIAGRAM of Nantahala hydro-generating station

Line Protection

All sections of the transmission lines are protected by three-phase, type IAC induction overcurrent relays. Both the Nantahala-Santeetlah section and the Glenville-Nantahala section of the transmission line are protected by directional ground relays at the ends of each section. The Nantahala-Santeetlah section is provided with directional impedance relays for protection against phase faults. Overvoltage protection, during a runaway condition, is obtained through the use of a tuned circuit device which may be set for a given frequency value. The contactor operates when the selected frequency is reached, cutting into the main field circuit a heavy cast-iron resistor which gives the maximum obtainable rate of drop in field current. Normal conditions are restored by the use of a neon-tube timing device which is pre-set according to a given length of time. This time interval is selected on the basis of tests of the unit under the usual amount of load which may be rejected during loss of load condition.

Modern Lighting in Modern Gage Plant

Light, temperature, humidity and vibration control are features of new Indianapolis gage engineering plant — Drafting room and laboratory are windowless

R. M. BROWN, Indianapolis Power & Light Company, Indianapolis, Ind.*

WHERE EXACTNESS transcends every other consideration, as it does in the precision engineering of the tools and gages for modern industry, controlled environment is vital to the exacting machining operations involved. In gage manufacture, as in no other industry, the control of light, temperature, humidity and vibration means the difference between accurate and sloppy measurement.

Design of the new Indianapolis plant of Merz Engineering Company, maker of gages, special machine tools, jigs and fixtures, is notable for the careful attention given to such environment factors.

The entire plant is fluorescent lighted to high standards. Production areas have an average intensity of 40 ft.-candles; offices and engineering department 45 ft.-candles. Highest intensity, 63 ft.-candles, is maintained in the gage inspection department, or precision laboratory.

Jig boring, precision grinding, inspection and engineering departments, as well as offices, are air conditioned. In the inspection department, however, where the extremely precise measurements are made, a separate air-conditioning system controls temperature to one-half a degree plus or minus and holds humidity to within 1 percent. To eliminate vibration completely floors of the jig boring, grinding and inspection departments (three separate rooms) are monolithic concrete slabs set in cork, making them, in effect, three vibrationless floating islands within the plant.

The new building, said to be the most modern gage manufacturing plant west of the Alleghanies, is of brick and steel construction and has a floor area of 36,000 sq.ft. It is divided into four major sections: (1) Office, (2) engineering department, (3) precision grinding, jig boring and inspection departments, and (4) the main production area.

ENGINEERS WORK under 45 ft.-candles in windowless, air-conditioned room with troffer units in acoustic ceiling. Brown vitreous tile wall reduces glare and contrast

Drafting Room

Both the drafting and precision laboratory are windowless, and in both the lighting and atmosphere are under complete control. Average lighting intensity in the 3,900 sq.ft. drafting room varies from a maximum of 47 ft.-candles to a minimum of 43. Wattage density is 1.3 watts per sq.ft. A total of 126 single-lamp louvered troffers, with 40-watt lamps, are recessed in acoustic block ceiling. Troffers are spaced on 4-ft. centers in the 12-ft. ceiling. Walls are light brown vitreous tile, which by test revealed the most satisfactory results as far as glare and contrast were concerned. Lack of definite lighting patterns on the walls is shown in the accompanying illustrations. Reflec-

*Lighting supervisor.

IN PRECISION LABORATORY exacting measurements are made under 63 ft.-candles of illumination with temperature at 68 deg. and humidity 50 percent. Room floats on cork to eliminate vibration

tion factors for the ceiling and side walls are 75 and 40 percent respectively.

Precision laboratory or gage inspection department, 432 sq.ft., has, as stated, a 3½-ft. thick floor of monolithic concrete slab set in 3½ in. of cork vibration insulation. The separate air-conditioning system holds temperature within half a degree at 68 deg. F. and within 1 percent of 50 percent humidity, so that measurements can be made as nearly as possible under identical conditions. Walls are insulated with 1-in. cork and 1-in. plaster, as is the true ceiling from which the acoustic ceiling is suspended. Two entrances are provided with double air lock doors mechanically interlocked to prevent more than one entrance being opened simultaneously.

Average lighting intensity in the laboratory of 63 ft.-candles is provided by 46 single-lamp louvered troffers on 4-ft. centers recessed in the 11-ft. acoustic block ceiling. Intensity varies from a maximum of 65 to a minimum of 61 ft.-candles, with a wattage density of 4.2 watts per sq.ft. Ceiling and wall reflection factors are 75 and 50 percent, respectively.

Production Area

Manufacturing and assembly areas are without air conditioning, but are lighted to an average of 40 ft.-candles by a total of 37,400 watts distributed over the 17,500 sq.ft. of floor to give a wattage density of 2.1 watts per

[*Continued on page* 61]

ILLUMINATION LEVEL is 40 ft.-candles in high and low bays of production area. Unique troffer arrangement in high bays is used where structure steel prevents continuous treatment

Stabilize Level and Spread of Utilization Voltage

Appliances and motors (not lamps) the crux of the effort to standardize the range of voltage designed to arrive at the point of utilization

C. E. ARVIDSON, Commonwealth & Southern Corporation, Jackson, Mich.*

IF ANY DEGREE of standardization of utilization voltages is to be achieved we must not worry too much about the voltage ratings of lamps, but should focus our attention upon other utilization equipment, such as three-phase motors, motor-driven appliances, electric ranges, etc. The present voltage ratings of lamps now connected to our systems should be of lesser concern, since their expected life is measured in hours rather than in years. Long-lived utilization equipment should, therefore, be the governing factor in the establishment of reasonable utilization voltage limits.

Apparent Obstacles

Another limiting factor which might not be given sufficient consideration is the probable effect of higher primary voltages upon the existing distribution equipment, such as capacitors, transformers, etc. Most of this equipment was designed to operate at or near some primary voltage which is a multiple of 115 or 120 volts. Voltages appreciably above these design values might create problems involving harmonics and capacitor failures. If future utilization voltages are increased to excessively high values the corresponding primary voltages must also be increased, and the attendant difficulties and problems would be aggravated. Therefore in establishing the maximum utilization voltage limits the limitations of existing distribution equipment should not be forgotten.

One of the major problems in any attempt to standardize utilization voltages is how to reconcile the difference between the three-phase voltages on odd-ratio and even-ratio systems having the same nominal service voltages. Fortunately, one of the motor manufacturers has recently simplified the future aspect of this problem by developing a new line of three-phase motors designed for operation at the voltages usually found on either odd-ratio or even-ratio systems. These motors can be connected so as to provide high starting torques with high operating efficiencies over a wide range of voltages. Although this new line of motors will be helpful in the selection of proper motors for future applications requiring high torques, they will not solve the problem of

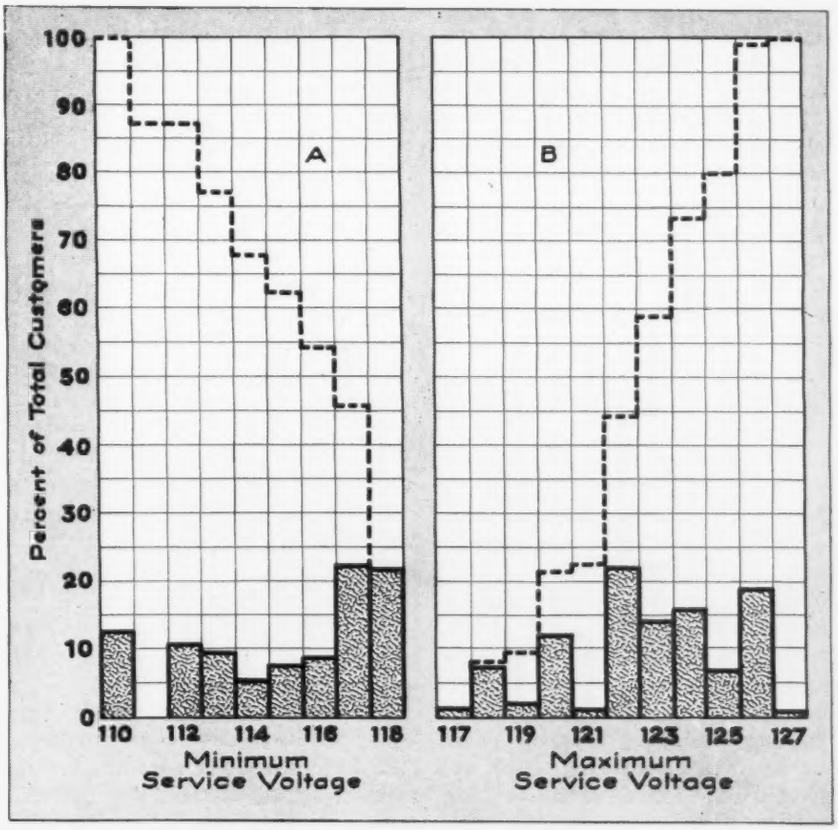


FIG. 1—Present practice converges toward 113-124-volt spread. Not less than 113 volts designed to reach 77 percent of customers nor more than 124 volts at service entrance for 73 percent

*Abstract of paper presented at recent meeting of Southeastern Electric Exchange, Savannah.

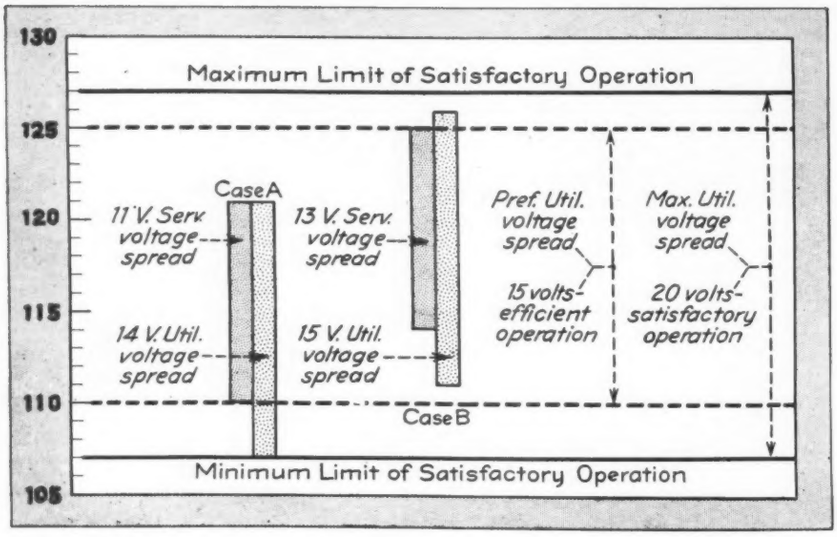


FIG. 2—Design voltage limits compared with maximum and preferred utilization voltage limits

operating the existing 220-volt motors at the relatively low three-phase voltages found on odd-ratio systems. The maximum utilization limits must, therefore, be high enough to insure satisfactory operation of existing 220-volt motors on odd-ratio systems and at the same time must not be so high as to result in unsatisfactory performance of the same line of motors when operated on even-ratio systems.

Compromises Made

Any compromises between 115- and 120-volt systems, which may be necessary if standardization of utilization voltages is to be achieved, should not be difficult to consummate. The actual differences in voltage levels between such systems are usually a matter of only two or three volts and the reason for this is obvious, since both systems must satisfactorily serve many types of utilization equipment having the same voltage ratings. Since the difference in actual voltage levels is small, several operators of 115-volt systems have expressed their willingness to raise their voltage levels the few volts required, but they first want to be assured that the vicious cycle of increasing voltages will not be repeated.

Regardless of the nominal voltage on any system, all customers and all types of utilization equipment cannot be supplied at that particular voltage. Electrical energy cannot be transmitted over conductors and through equipment without some voltage drop and the best we can do is to provide utilization voltages within reasonable maximum and minimum limits. The establishment of these limits calls for compromises between the economic limitations of the distribution systems and the abilities of the various types of utilization equipment to perform satisfactorily and efficiently under variable voltage conditions within such limits.

Maximum Spread

The first step toward standardization of utilization voltages should be the determination of a maximum utilization voltage spread for residential customers and the limiting values. Such limiting values should recognize existing distribution equipment and design practices as well as existing utilization equipment, and would represent the maximum utilization voltage spread within which present and future utilization equipment would operate satisfactorily if not most efficiently. Such a spread and the limiting values have already been established by existing design practices and need only recognition and approval.

None of 45 informant companies serving approximately 10,000,000 customers design for service voltages greater than 127 nor less than 110 (Fig. 1). Since these companies are providing reasonably satisfactory service for the customers' utilization equipment, these values should represent reasonable maximum and minimum limits for the service voltage spread.

The maximum utilization voltage spread for residential customers would be greater than the maximum service voltage spread by an amount representing a reasonable maximum voltage drop in customers' wiring from the service entrance switch to the terminals of the utilization equipment. An allowance of zero volts minimum to 3 volts maximum should be reasonable for the voltage drops in customers' wiring. An agreement on these values and the maximum service voltage spread limits mentioned above would establish the maximum utilization voltage spread at 20 volts, with limits at 107 and 127 volts.

Preferred Spread

The next step in the interest of efficient appliance operation and future standardization should be the establishment of a preferred utilization voltage spread and its limiting values for residential customers. Such a spread should not be so small as to handicap distribution systems in sparsely settled areas nor so great as to affect adversely the cost or the operation of future utilization equipment. The limiting values would represent the maximum utilization voltage spread within which present and future equipment would operate most satisfactorily and efficiently.

Almost 80 percent of the customers served by the informant companies receive service voltages between 113 and 125 volts (Fig. 1). Allowing zero volts minimum and 3 volts maximum for voltage drops in the custom-

Utilization Voltages—Limiting Values for 110 and 220-Volt Motors

	Even-Ratio Systems		Odd-Ratio Systems	
	110-Volt Motors and Misc. Appliances	220-Volt Motors	110-Volt Motors and Misc. Appliances	220-Volt Motors
Maximum Utilization Voltage Spread				
Maximum limits	*127	*254	*127	220
Minimum limits	*107	214	111	193
Preferred Utilization Voltage Spread				
Maximum limits	*125	*250	*125	216
Minimum limits	*110	220	114	*197

*Indicates limiting values of utilization voltages.

ers' wiring, a preferred utilization voltage spread of 110 to 125 volts is obtained. The remaining 20 percent of the informant companies could come within these preferred limits and thus provide more efficient operation of their customers' equipment by changing their voltage levels only a small amount.

The preferred utilization voltage spread and limits of 110 to 125 volts were agreed upon by the transmission and distribution committee of Edison Electric Institute at its meeting on February 19, 1941 (subject to confirmation by letter ballot), to be submitted to the electrical equipment committee as tentative values for its consideration. These limits are to be construed as five-minute mean values at the appliance with corresponding service voltage limits of 113 to 125 volts, respectively.

Limits for 220-Volt Motors

The study by the transmission and distribution committee of utilization voltage limits for 220-volt, single-phase and three-phase motors has not been completed. It may be permissible, however, to discuss one method of attack and to speculate on the probable results.

The top limits of the maximum and preferred utilization voltage spreads for 220-volt motors and their associated control equipment should be determined by the requirements of the even-ratio systems and therefore would be equivalent to, or slightly lower than, the maximum utilization limits for residential customers, *i.e.*, 254 (127) and 250 (125) volts, respectively, with corresponding maximum service voltages of equal magnitude. The lower limits of the maximum and preferred utilization voltage spreads for these motors are governed by the odd-ratio systems and would be equivalent to the lower limits for residential customers except that odd-ratio systems must be designed for relatively small voltage drops to avoid excessive flicker due to motor starting on these combined light and power secondaries.

Most of the companies operate their odd-ratio network systems at 120/208 volts or higher at the service entrance, and although a few companies allow the service voltages to deviate 5 percent from this level the majority of the companies maintain this or a slightly higher service voltage level within plus or minus 3.0 to 3.5 percent. If these operating and design practices are representative of all odd-ratio systems, radial or network, the lower limits of the maximum and preferred service voltage spread should be in the order of 198 volts (208 volts less 5 percent) and 202 volts (208 volts less 3 percent), respectively. Again allowing 3 volts phase to neutral or 5 volts phase to phase for drop in the customers' wiring, the lower limits of the maximum and preferred utilization voltage spread would be 193 and 197 volts, respectively.

If this reasoning is logical and if the conditions referred to are representative of most odd-ratio systems the maximum utilization voltage spread and limits for 220-volt motors would be 193 to 254 volts, with corresponding service voltage limits of 198 to 254 volts, respectively, and the preferred utilization voltage spread and limits for these motors would be 197 to 250 volts, with corresponding service voltage limits of 202 to 250 volts, respectively. As stated before, the study of utilization voltages for 220-volt motors has not been completed and the above values are therefore only speculative.

Suggestions

How will the suggested maximum and minimum utilization voltage limits apply to particular systems? This question can best be answered by substituting one's own design voltage values for those assumed in the following examples, which are illustrated in Fig.2:

Examples	Case A	Case B
Nominal voltage	115	120
Maximum service voltage	121	127
Allowance for minimum voltage drop in customers' wiring	0	1
Maximum utilization voltage	121	126
Minimum service voltage	110	114
Allowance for maximum voltage drop in customers' wiring	3	3
Minimum utilization voltage	107	111

These examples represent rather extreme cases in distribution system design.

In future discussions of utilization voltage spreads for 220-volt motors it might be well to correlate the relationship between even- and odd-ratio systems as shown in the accompanying table. The limiting utilization voltages used in this table are those which have been discussed herein. Other values may be substituted after they have been agreed upon.

It should be noted that the maximum and minimum voltages for 110-volt motors and the maximum voltage for 200-volt motors are governed by the even-ratio systems, but that the minimum voltage for 220-volt motors is determined by the odd-ratio systems. Therefore, the maximum and preferred utilization voltage spreads for 220-volt motors must be greater than the spread for 110-volt motors.

Modern Lighting in Modern Gage Plant

[*Continued from page* 58]

sq.ft. The RLM type units are mounted, as shown in the illustrations, with 208 three-lamp units mounted 20 ft. high over the thirteen crane bays and 156 two-lamp units mounted 12 ft. high over the thirteen outer bays. Continuous channels are used where the arrangement of the structural steel permits. But over the crane-way, where the steel sway bracing obstructs this arrangement, single and double units are arranged symmetrically to provide the same wattage density as where the continuous channels are used. Forty-watt lamps are used in all fixtures. Spacing of the units in the low bays is 10 ft. on centers, while equivalent spacing in the high bays is 12 ft. Reflection factors for ceiling and side walls are 50 and 30 percent respectively.

Power supply for the plant is at 440 volts. Bus-duct feeder system provides flexibility for machine relocation. All machine tools in the plant are individually driven. Power conduit from the bus-duct to the machine goes to the floor from the power take-off and thence through channels in the wood block floor, filled with mastic, direct to the machine. Some power-factor correction is provided by a 75-hp. synchronous motor that drives the plant's central air compressor, a Sullivan two-stage machine.

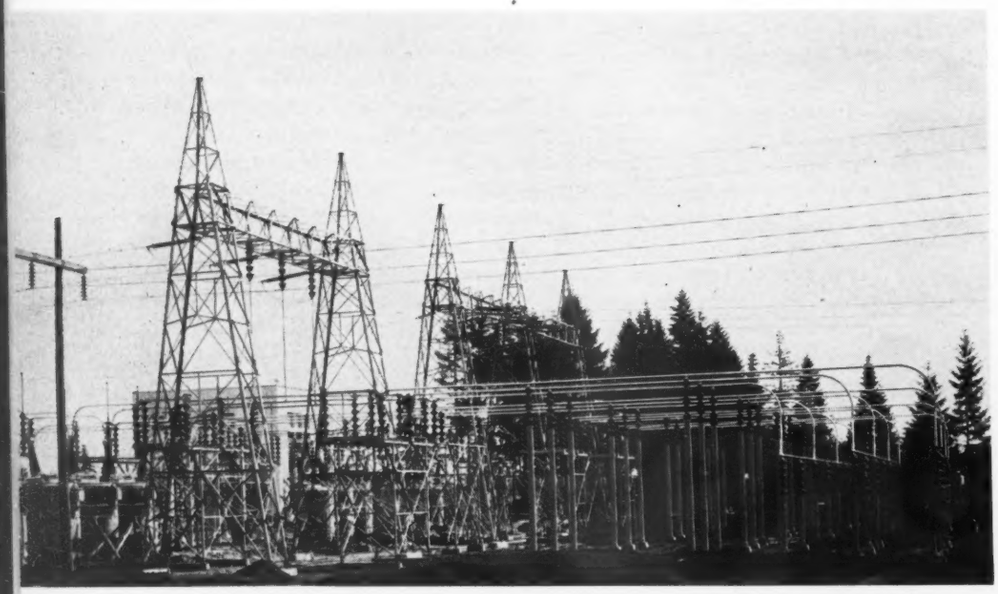
Lobby of the plant is lighted with daylight fluorescent lamps recessed above a flush glass panel, providing an intensity of 75 ft.-candles. General offices are lighted to 35 ft.-candles by troffers in the acoustic block ceiling.

Merz Engineering Company is supplied with power by the Indianapolis Power & Light Company, whose lighting specialists cooperated in the lighting design for the new building.

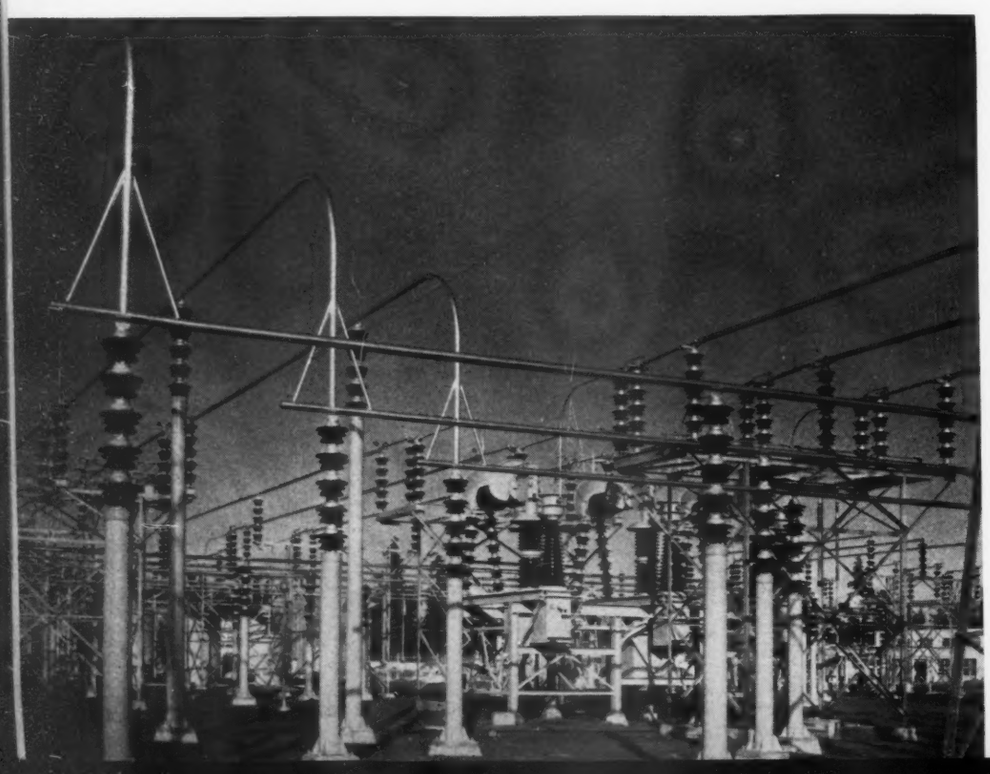
Substations by the Dozen Built by Bonneville

Standardized patterns, mass production and high-speed construction afford flexibility in strenuous effort to keep up with phenomenally growing demands

RICHARD F. STEVENS, Bonneville Power Administration*



CHEHALIS 230-kv. substation has typical pedestal construction. Space has been reserved for a second oil switch for each circuit



RIGID welded steel bus (aluminum was formerly used)

North Vancouver has the two buses side by side in the middle of the yard, with dead-end structures for the various circuits at either side. At most of the other stations the lines are carried overhead to a dead-end structure between the two buses. In all cases the switchyard is assembled from a comparatively small group of standard dead-end towers, bus pedestals, disconnect support structures, carrier-current support structures, disconnecting switches, oil circuit breakers, etc.

CHALLENGED by the necessity for high-speed construction of a complete high-voltage power transmission system, which must tap power sources ultimately totaling nearly 10,000,000 kw., and which must be built largely in anticipation of loads not yet developed, Bonneville Power Administration engineers have adapted the principles of mass production to their construction program. One of the most successful applications of such principles has been achieved in the design and construction of substations.

News in an earlier issue of ELECTRICAL WORLD (August 2, 1941, page 6) recited the projects in process and particularly the great difficulty in establishing for each station a capacity figure which will not be doubled or quadrupled before it is finished. Thus the same need for great flexibility in substation design has been experienced as was the case in connection with the Bonneville power house itself (see "Bonneville Designed for Problematical Loading," ELECTRICAL WORLD, September 11, 1937, page 69).

* Assistant chief, design section.

This necessary flexibility has been sought in the following ways:

1. Substation sites purchased are nearly always very large. Land costs are usually small, relative to the other costs. This provides for any necessary future expansion and decreases considerably the chance of the site being "bottled up" by surrounding developments, so that additional lines cannot be taken out.

2. One end of each bus is invariably kept open for possible expansion, unblocked by permanent structures.

3. Room is provided at all major stations for a double-bus, double-breaker installation, even though initially less equipment may be installed.

4. Control rooms are liberal in size. In some cases end walls of control room are of tile to permit further expansion if some unexpected need develops.

5. Room is provided for possible incidental equipment not at first required, such as additional carrier equipment, supervisory control equipment, telemetering equipment, etc.

6. Stations are made up, so far as possible, from standardized parts.

Standardization

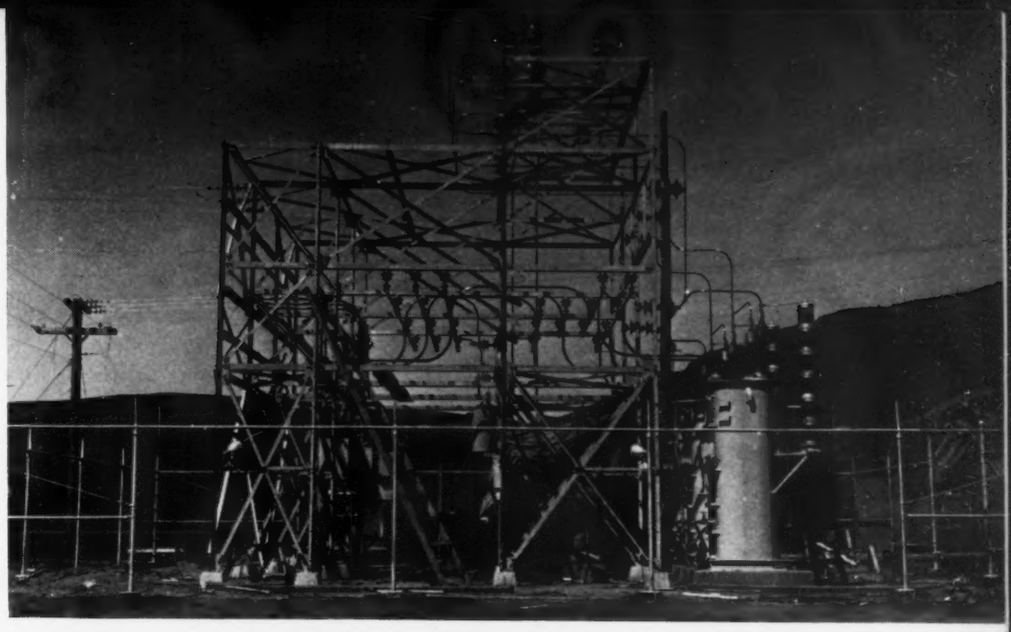
Standardization is most important. By making each station an assembly of standard units rather than a custom-built job, the design work lost by shifts in size or location of loads is greatly reduced, and waste of materials from this cause is practically eliminated. Standardization has permitted rapid completion of units with a newly assembled organization. Design and stocking of standard parts (steel structures, bus pedestals, transformers, portable temporary control houses, etc.) has helped many times.

Bonneville has thus used, for large wholesale power loads, methods usually limited to smaller distribution types of substations, particularly for industrial customers.

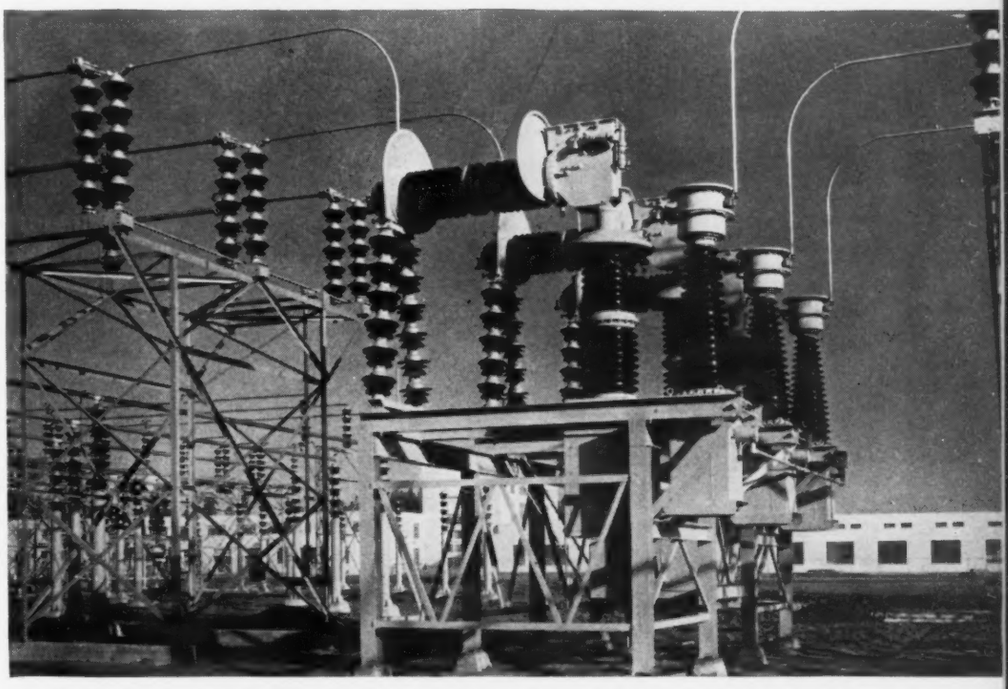
For 115 kv. and 230 kv. the bus is the rigid pipe type, supported from the ground by oil switch bushings and disconnecting switches and by heavy-duty insulator stacks on tapered tubular steel pedestals.

At all major switching stations, and at stations which conceivably might later grow into important centers, space has been reserved for an ultimate double-bus, double-breaker scheme when and if desired.

At present the main and auxiliary

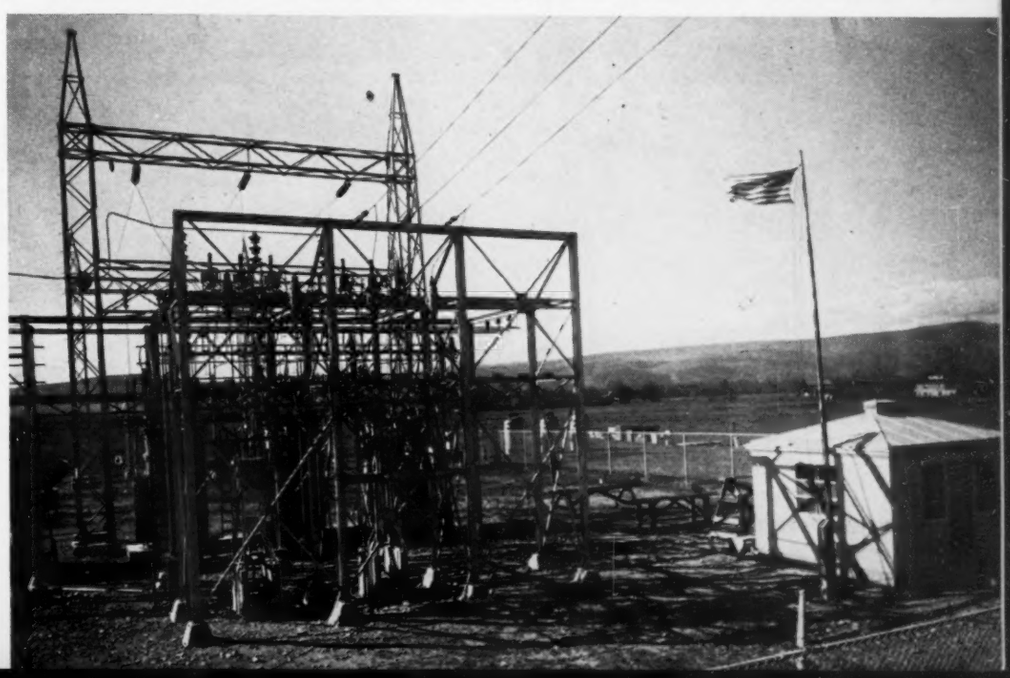


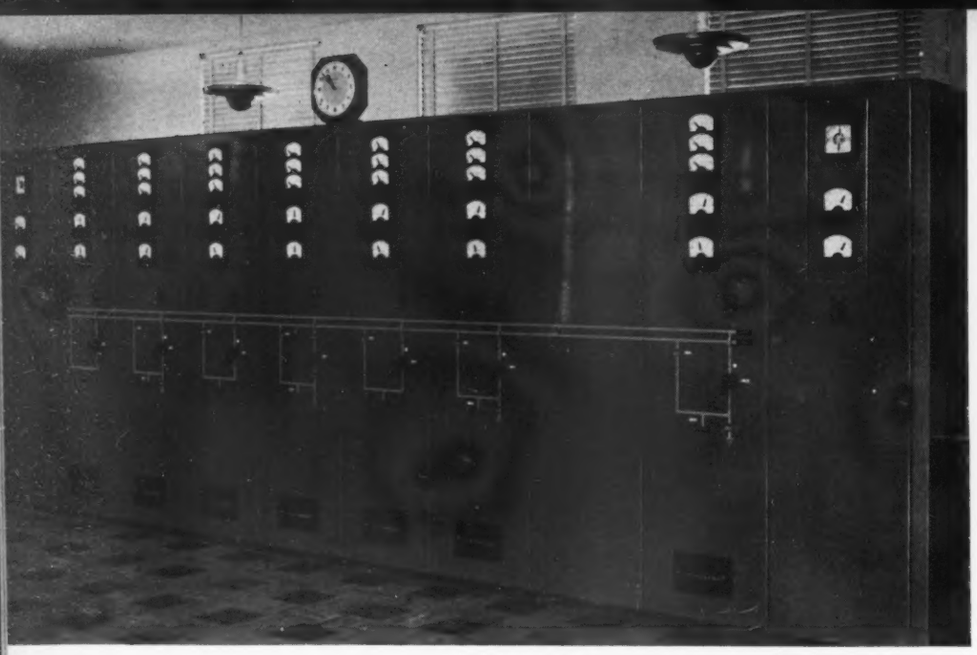
STANDARD PATTERN for 69-kv. substation being followed in Pendleton station



THREE-CYCLE General Electric impulse-type 196/230-kv. oil breaker at North Vancouver station

STANDARDIZED portable control house provided at typical 115-kv. small substation at Ellensburg





MOVABLE synchronizing panel is hinged in a window cut in a full-sized standard panel of standard Bonneville switchboard. Improved appearance and fewer bumped heads

bus scheme is used at most substations, with one breaker per circuit, plus a spare breaker which can be substituted for any other by use of the auxiliary bus. Sectionalizing switches in the main buses are now provided only at "Alcoa" substation, where special conditions have dictated the use of a ring bus.

Aluminum bus was originally adopted as standard for the higher voltages. Strength and lightness were desired to permit long spans with minimum deflection, and ferrous metals were avoided largely to eliminate the need of occasional shutdowns for repainting. Aluminum or aluminum-lined clamp type connectors were used with all aluminum buses except at Astoria, where aluminum welding was very successfully employed.

Recently steel bus has been substituted for aluminum throughout, except where aluminum stock on hand has been used for minor extensions to existing aluminum buses.

Steel bus has sufficient current-carrying capacity at 115 kv. and 230 kv. without exceeding 4½-in. iron pipe size. Bonneville makes, from its own standard designs, all bus supports and what few connector fittings are needed. The welded bus presents a streamlined appearance neater than that obtained with clamp-type fittings and obviates worry over the possibility of a major job being held up by late delivery of a small bus connector. The T-joints with braces are welded in the shop and are set in place on bus pedestal insulators for field welding to adjoining bus sections.

69 Kv. and Lower Voltages

In general, the scheme of connections for circuits of 69 kv. and lower is electrically the same as for 230-kv. and 115-kv. circuits.

Initially, consideration was also given to the same type of physical construction, with buses supported from the ground by apparatus bushings, bus support pedestals, etc. However, due to the smaller size of lower voltage equipment, the bus would not have been at a safe height and it would have been necessary to fence in the bus area. Even with the fence it was felt that the safety to workmen would be less than if the circuits were isolated by their height. For this reason the familiar type overhead steel structure was used, with lattice girders and columns for 69 kv. and rolled shapes for lower voltages.

Copper buses are used at 69 kv. and below, as large diameters are not needed for mechanical reasons, whereas a high conductivity is usually required.

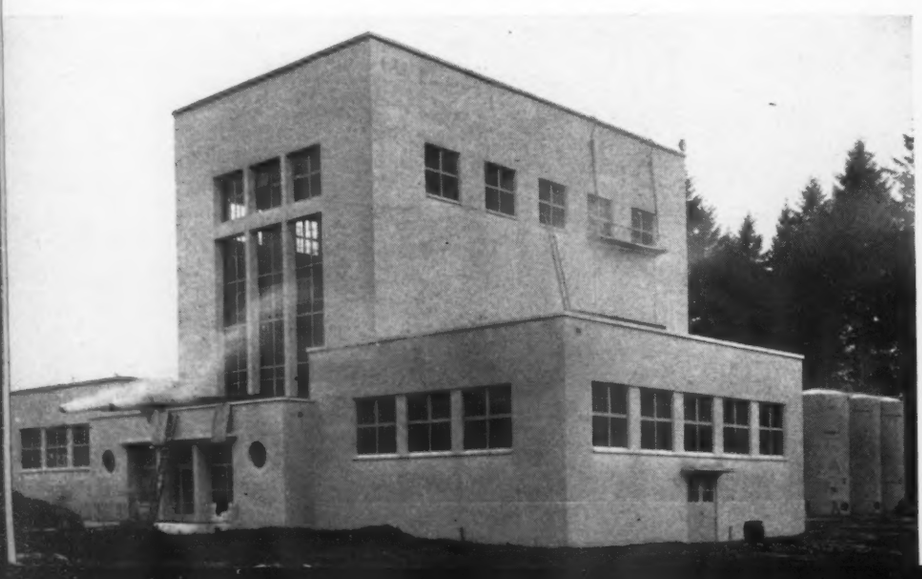
Oil Circuit Breakers

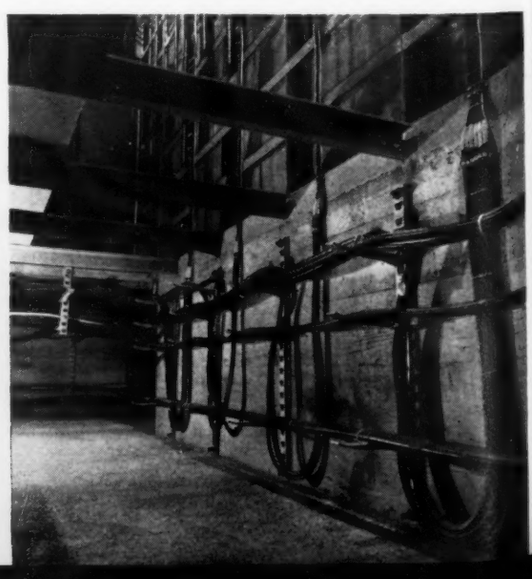
Calculations have shown an economic justification for three-cycle breakers in all 230-kv. line positions, and this type is standard. G. E. impulse-type breakers are used at the North Bonneville, North Vancouver and Covington substations. The three-cycle breakers at Midway and Chehalis are the conventional tank-type, as built by the Westinghouse company. However, since transformer outages are likely to occur with much less frequency than line outages, three-cycle breakers in transformer bank positions are not considered justified and the cheaper eight-cycle type is used. Studies likewise show that eight-cycle breakers are satisfactory on the 115-kv. system.

In the design of control houses much time has been saved by development of standardized design. The typical control house contains

[*Continued on page* 122]

TWO OTHER major stations have combination shop, storeroom and transformer untanking tower like this at Chehalis (unfinished). View at right shows typical control cable trench below terminal cabinet room floor. Slack is provided for contemplated future changes





Commercial Cooking Sold to Stay Sold

Idaho Power sales plan built on solid customer satisfaction, semi-annual follow-up, company servicing to keep equipment in use and avoid load mortality

ORLAND C. MAYER,* *Idaho Power Company, Boise*

THE UTILITY sales department job is developing a new direction nowadays and that is the job of keeping an eye on installations of equipment to be sure they are used more intensively and that proper servicing keeps the equipment in use and provides revenue to the company.

Our commercial industrial sales department was organized in 1930, comprising eleven men promoting lighting, heating and power to commercial customers. Approximately one-third of each man's time is spent on commercial cooking and baking.

Follow-up Necessary

The first installation of any consequence secured by the newly organized department was in the Hotel Boise and many interesting difficulties were encountered in the sale of this job and in *keeping it sold.* Suffice it to say, the job has been in continuous operation for more than ten years and is still giving satisfactory and economical service. Maintenance and servicing has been extremely low. During this period of time, however, it has been necessary to keep a close check on the installation in order to educate new cooks and chefs in the technique of handling electric cooking equipment. This type of follow-up work is becoming of increasing importance. The cooperation of the hotel management has been excellent and letters heartily indorsing electric equipment have been given by the three different managers of the hotel.

IN SERVICE for ten years, indorsed by three successive hotel managers, this 104-kw. installation at Hotel Boise has survived numerous new cooks and chefs due to careful utility company supervision of operations

With this job as a starter the organization launched on a program to secure additional commercial cooking installations. It was soon found that the installation at the Hotel Boise was discounted by small restaurateurs. "Yes," they said, "the Hotel Boise can use electricity economically for its cooking operations, because it uses a large number of kilowatt-hours, but for smaller users like us electricity is too high."

The solution to this problem had to be actual installations and not figures. The next step was to sell smaller installations. This was accomplished and then the job was to sell the vast market between these two extremes. This also has been done.

The following tabulation shows the results secured in the past few years:

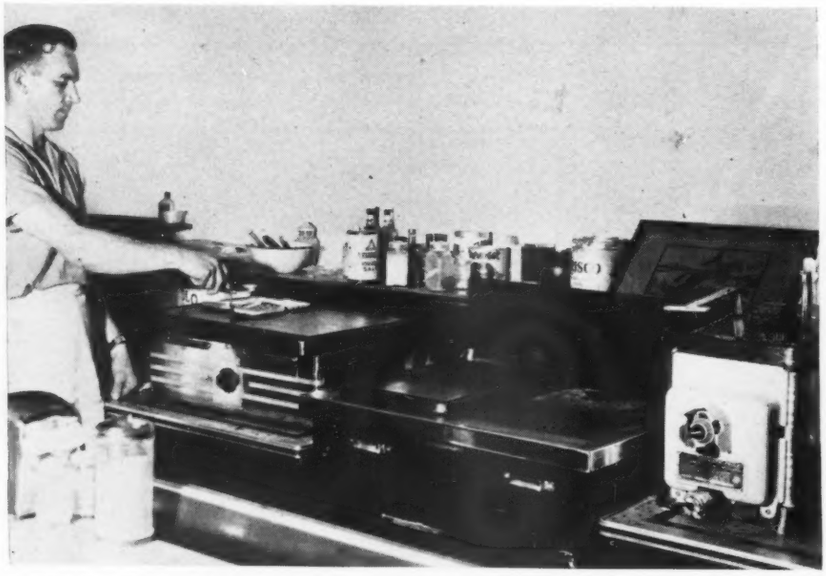
Year	Kw.	Est. Annual Rev.
1941	1,740	$35,000
1940	1,401	26,000
1939	1,410	26,000
1938	1,510	28,000
1937	835	22,000
1936	900	30,000
1935	405	11,000
1934	260	7,000

The above figures are in round numbers and are calculated on the actual step of rate on which the serv-

* Commercial and industrial sales manager.

ice is used. During this time there have been several rate revisions.

One of the first problems encountered was that of locating outlets for the sale of equipment, preferably the hotel and restaurant supply houses already serving the territory selling the equipment. With this thought in mind the major hotel supply houses were contacted. They were very fair in considering our proposition for them to merchandise equipment, but pointed out that direct fuel cost comparisons were unfavorable to the use of electricity. Moreover, servicing



"KEEPING THE CUSTOMER SATISFIED" applies with equal force to the many small installations in the territory, typified by this 18-kw. arrangement which serves 200 meals per day

was difficult as they had no offices in the territory and equipment was very limited in its application to the smaller restaurants and 90 percent of the market was small restaurants. Accordingly the following suggestions were made by the Idaho Power Company to the restaurant supply houses:

1. The company would give the customer estimates on operating costs and sell them on the advantages of using electric service.

2. The company agreed to assume the obligation of servicing the equipment.

3. It was further agreed that if the company would sell equipment they would purchase this equipment from the supply houses in all cases where the hotel's supply salesman had assisted in the selling job. This made a very fine working agreement and seems to be one of the basic factors in attaining and retaining the present cooking saturation.

There is no substitute for a carefully planned and properly executed sales story, with adequate follow up, to promote and hold electric cooking loads. The customer's confidence must first be gained through the sales of the smaller and more acceptable pieces of equipment. The steps in a sale might be described as follows:

1. Be sure that the customer is satisfied with all the electric service he is now using, whether it be for lighting, heating or power purposes. If he isn't satisfied with any particular service, that service should be investigated and explained to the satisfaction of the customer.

2. Show how the rate upon which the customer is served is an economical rate and that additional service on that rate can be advantageously used.

3. Sell electricity as the most satisfactory source of heat. This should be done by, first, creating in the mind of the customer a need for a new method of cooking and, second, showing that electric cooking is superior to any other method. In other words, it is electric service and what it will do that the customer is buying. In this step the cost of operation is discussed. The customer is interested in his over-all costs, including not only cooking but such items as air conditioning, redecoration, working conditions, etc. Each of these should be given a definite value, established in agreement with the customer.

4. When the customer is satisfied that electricity is the most economical method to fill his needs, then types of equipment are discussed.

5. After the equipment is installed the commercial representative must spend time with the cooks to determine that the operation of the equipment is clearly understood. This must be very tactfully done and requires a commercial salesman who understands the major problems of the cook.

6. *Keeping the customer satisfied.* This is in most cases a constant job. At first it might seem an unnecessary procedure to keep in contact with the customer once he is satisfied, but new cooks are constantly taking over the cooking operations, and many of them are inexperienced in the operations of electrical cooking equipment. More frequent contacts are necessary where labor turnover is greater. But every commercial cooking customer should be contacted at least twice a year. In a few cases it has been found necessary to read the kilowatt-hour consumption daily and keep a chart of the kilowatt-hours used per meal. Various schemes have been used, such as offering pictures of the installation to the cooks if they will maintain a certain kilowatt-hour consumption per meal.

To be sure, our service is already sold when the customer operates satisfactorily for one month. But the customer is just as likely to become dissatisfied with our service as he is with the kind of dishes he uses or the brand of food he buys. All in all, our experiences show that keeping in touch with the customer is a very vital part in keeping the customer a satisfied user. Satisfied customers are the best basis for securing new users of electric cooking and holding present users.

Consider Territory

Again, consideration must be given to the type of territory served. At first supply house salesmen working this territory had their headquarters at large towns located from 400 to 500 miles from the center of our service area. This plan had many obvious disadvantages for the supply house and the customer as well as the utility.

[*Continued on page 127*]

Live-Line Guards for Hot-Line Maintenance

Linemen are protected from live circuits — Easily installed and adjusted for working on any phase conductor

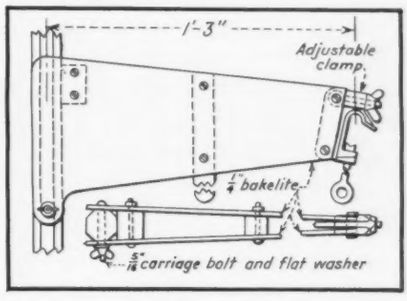
M. L. FISHER,* Ohio Power Company, Canton, Ohio

ON MEDIUM-VOLTAGE transmission lines where no covering equipment can normally be used and where safe climbing and adequate working clearances of the high-voltage lines cannot be maintained, constant vigilance is more than ever the requirement for working safely. Picking up conductors on wire tongs or lifting poles and laying them out from the structure is resorted to here to a greater extent, and particularly on certain types of structures, such as straight line pin and suspension types and structures with small angles. This has not been practical, however, on dead-end structures. On 22- and 33-kv. lines, for instance, with two circuits in vertical configuration supported on 7-ft. wood arms, it has been necessary to take one circuit out of service to replace an insulator on one of the top conductors, in order to provide safe working clearances.

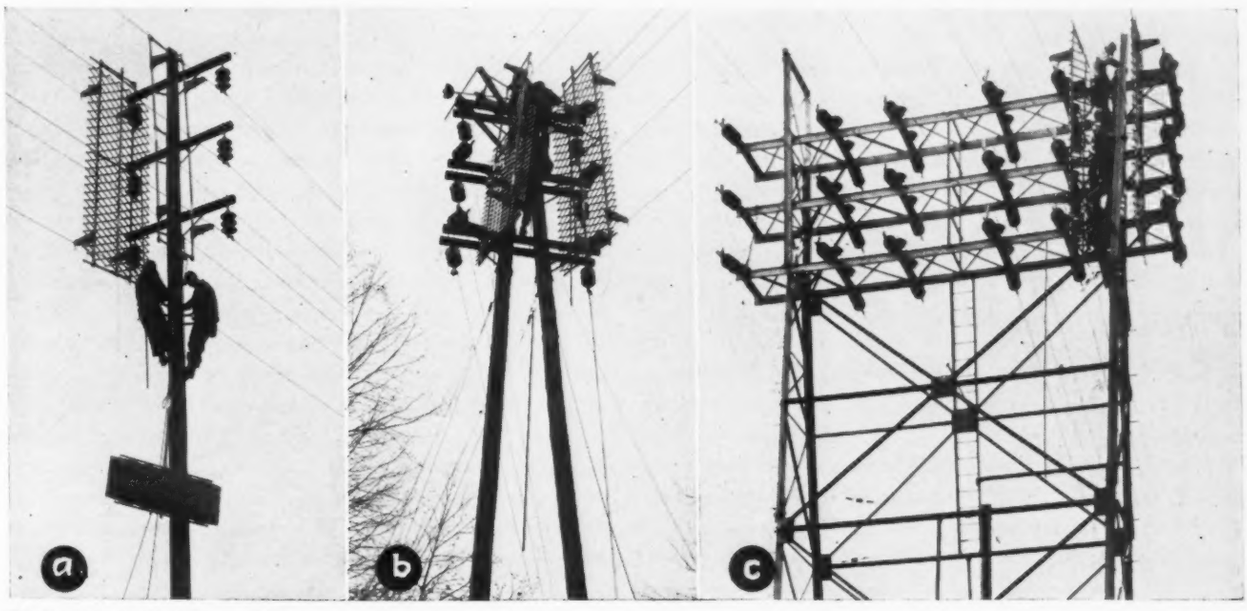
To make it possible to do live-line work more safely on this type of structure an extensible wood guard was designed to shield workmen from live conductors.

The live-line guard is designed to shield one, two or three conductors as the case may require. If an insulator is to be replaced on the top conductor assembly the shield is expanded to a position above the middle conductor and the top conductor assembly left clear to be worked on. To work on the middle conductor the shield can be left in the closed position, blocking out the bottom conductor only. The other circuit is blocked out entirely by raising the shield on that circuit to its extended position.

The live-line guards were ordered from a manufacturer of live-line tools. Bakelite brackets or arms have been substituted for the plywood brackets originally ordered, to add strength. The extensible shield proved to be somewhat heavier than expected. However, this has been met by hanging the shield onto the framework, which is installed first, by means of a 16-ft. pole spliced in the middle, to which the shield is attached. At the top of this pole is a small pulley through which a small rope runs to raise the shield to the desired height.



DETAILS of bracket for live-line guard



Application of live-line guards

(a) Installing guards on a suspension structure with a straight-through double circuit. After frame is positioned, extensible shield is hauled up and attached to frame. (b) On an A-frame structure for small angles guards are used on replacement of insulators on the top phase of a double-circuit 22-kv. line. (c) Guards placed on a 22-kv. steel tower line. Installation of a ground wire necessitated the erection of peaks at the top of the structure. Load conditions prevented taking out of service more than one circuit at a time. Steel for the peaks was moved up between the two live circuits and erected in place safely and efficiently.

*Chief transmission engineer.

Editorials

S. B. WILLIAMS, *Editor*

The Public Still Wants Fair Play

THE most hopeful sign that we have seen in many a day is the result of the election last week in San Francisco on municipal ownership. Seven times before voters in that city had turned down political ownership, but this time they did something more. They told Mr. Ickes and Mr. Roosevelt that they were not going to be dictated to by Washington.

This is the second time this year that the Administration has put its full force behind a local M.O. election and lost—Spokane in the spring and San Francisco in the fall.

The American people are not yet ready to give up their political freedom. They are not afraid of the creatures of their own selection. They will not be regimented. They will not be threatened. They will not stand for foul play.

Spokane and now San Francisco should give utility management great encouragement. The Supreme Court may no longer be relied on, but justice and fair play still abide in the highest court of all—the court of public opinion.

Mirabile Dictu

THE THING that couldn't be done is going to be done. An advertising program paid for by a cooperating group of operating electric light and power companies is to start in less than a month in several national magazines to tell the public something about the electric service provided by business management.

The program isn't as big as it should be, nor is the amount of money available or the number of participating companies. Nevertheless, it is a start and, praise be, it is proof that there are enough executives in the industry who can and will work together for the common good. It is more than that—it is proof that there is still leadership among utility men, still courage, still belief that the battle is not lost, still the will to fight for what they believe.

Outside of the utilities' exhibits at the Chicago and New York World's Fairs, this will be the first time a large group of operating utility companies have got together for a common promotion of their story to the public. That in itself is an achievement. Nor was this a spontaneous accomplishment. It took a lot of hard work and persuasion on the part of an inspired few.

One of the greatest hurdles this campaign will have to get over will be that of criticism of the copy. We would remind these critics, first, that the agency preparing the copy has had long experience in doing similar work for the telephone people and, second, that this is new ground for electric utilities. We must not be impatient.

For the time being the big thing, the most encouraging thing, is that utilities from different sections of the country have got together on some one thing. Mirabile dictu!

An Untapped Reservoir of Power

ELECTRICITY in terms of millions of kilowatts on hand right now. No waiting for power plants to be built. No drain on supplies of steel, copper, aluminum and other critical metals and materials. No diversion of skilled labor that could be better employed in producing defense requirements. Electricity production capacity installed, standing ready, waiting to carry load.

Where is this capacity? It is right here in the United States. It has been here all the time. Now, with the Navy pre-empting turbine manufacturing capacity, such a resource of available power should be given our careful attention.

Practically every electric utility system in the country, particularly of those that are wholly or predominantly fuel powered, includes generating equipment that is used only a very few hours in the year. It is not reserve capacity that is meant—that would make another story. It is the capacity represented by production facilities that are used to carry load regularly, but for only short periods. For the rest of the year, 90 percent or more, it is idle.

Such measures as are taken, and which have already been advocated by Mr. Knudsen and others in the national defense organization, for employment of idle industrial capacity will also put to work a corresponding amount of idle electrical capacity. Yet it is not necessary to wait upon solution of the many problems which complicate the industrial capacity picture in order that use be made of now idle electrical capacity. A comparatively few electro-process industries can absorb much of it very quickly.

This is not to assert that there are no difficulties in the way of supplying energy from this now idle capacity. The difficulties are not played down in the analysis which will be found in this issue. In some cases they may be

insurmountable. But it would be no trick at all to assemble from men of long experience in the electric utility industry an impressive body of opinion indicating that in many instances the difficulties are more intimidating than they are actual. And when, and if, we do find ourselves confronted by the inexorable conditions of a real war economy we shall be forced to tackle many big things in a big hurry, among them the job in certain areas of getting every obtainable kilowatt-hour out of every kilowatt of generating capacity. Much better to get going on the job now, while there is still time to do it in the best and most effective way.

Power-Rationing Blueprint Set in Southeast

OPERATION of the power-rationing program in the Southeast as explained in this issue deserves study by all electric utilities. A few weeks ago this might have been looked upon as a local situation, not affecting those outside the interconnected supply area. The announcement, however, that the Navy is going to take over a larger part of the productive facilities of the turbine manufacturers puts an entirely different complexion on things. A substantial part of the utility turbines scheduled for delivery in time to be available for 1942 and 1943 peaks will be sidetracked.

Obviously, if, as the Federal Power Commission has often stated, our power supply for 1942 and 1943 is inadequate even with the new capacity on order, there are possibilities of power rationing being necessary in other areas before another year has passed.

There will be a difference, of course. In the Southeast there are sufficient kilowatts but a shortage of kilowatt-hours. In rationing elsewhere that might result from inability to get turbine deliveries the problem will not be kilowatt-hours but kilowatts. The approach to the situation, however, by the power-regulating authorities will probably follow pretty much the blueprint drawn for the Southeast.

It is too early yet to know just how much utility turbine production is going to be sidetracked by this Navy move. Some utility capacity will have to be allowed to go through because of its defense essentiality. In general, however, the determining factor will probably be the extent to which rationing of civilian demand will be sufficient to take care of the situation.

Interconnection will also play an increasingly important part and every advantage will be taken not only of diversity but of reserves. In fact, if power rationing does come as a result of the turbine situation it is highly probable that some new concepts of the degree to which peak load must be backed up by reserve may develop. The industry is gradually learning in different ways that factors of service reliability safety need not be so great.

Out of this situation also should come a decision by the Defense Plant Corporation to place new defense plants where power is available; if not all the time, at least 90 percent of the time. There is a vast reservoir of kilowatt-hours in the major manufacturing area of the country, as shown in this issue, that can be tapped without recourse to new turbines.

The experience in the Southeast indicates that there is an economic limit to the distance this power can be shipped. That will probably mean smaller areas for rationing than formerly conceived.

Because of the experience of the past eight years it is not possible to view any action such as this one on the part of the Navy without some misgivings. It would be a shabby trick indeed if this deferment of steam turbine orders were used successfully to get the green light for St. Lawrence or Arkansas Valley Authority.

While rationing programs will be costly to the utilities, in that higher revenue load will suffer most, the situation is not without its brighter side. If the government is correct in its assumptions that the war can be brought to a victorious end in two years or less, the less capacity the industry has at that time to stand idle the better will be its economic position. Also, by postponing new capacity at this time utilities can delay further depletion of cash position. That is extremely important right now.

This action of the Navy automatically removes any blame for power shortage from the industry should rationing become necessary. It does not, however, erase any of the industry's responsibility for foreseeing a shortage and being as ready for it as possible through interconnections, trained personnel, and—public understanding.

Bill Goodwin

A QUARTER of a century ago there came out of California an intense, inspiring red-headed man, large of frame and heart, who preached the gospel of cooperation between the several commercial branches of the electrical industry. Wherever he went crowds gathered to listen to the man who was trying to bring order out of a chaotic merchandising situation. Honors were paid him by more than one national electrical organization and at the height of his efforts twenty years ago he was probably the most-talked-of man in the entire industry. Two weeks ago he died in obscurity.

Ahead of his time by nearly a generation, he nevertheless laid the groundwork of industry thinking for what is now known as dealer coordination and for cooperative market development. His thinking influenced the thinking of thousands, and though none of his own programs ever survived in their entirety, the impress that he left on the industry for cooperation in sales and marketing was lasting. Though almost as many disagreed with him at the time as agreed, his basic principles were sound, as later years have proved. The electrical industry will always be his debtor.

That man was Bill Goodwin.

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

Pattern Being Set for Handling Power Shortage

TO OPM Power Coordinator J. A. Krug and his staff at Atlanta the blueprint they are drawing for meeting a kilowatt-hour crisis caused by drought and aluminum in the Southeast is a pattern for rationing power if and when it must be applied elsewhere.

This is not to say that Krug and his aids are looking for other areas in which to impose curtailment, as is often the habit of government agencies once they have tasted authority. Quite the contrary is true, in the light of the lengths to which Krug went to tip the scales in favor of postponing the most drastic part of the Southeastern program—a mandatory 30 percent reduction in energy use by industrial and large commercial consumers.

Rather, they realize that war-born demands for energy, plus the increasing pinch upon utilities seeking equipment, is likely to spawn similar problems in other regions before the shooting stops. Which makes the Atlanta experience a case history of importance.

Setting Precedents

Viewed by the OPM power branch as a case history, the Atlanta proceedings, from another angle, furnish utilities with a concise preview of how this staff functions in working out a problem for conserving power to insure a constant supply for vital war requirements. Whether actual curtailment of use by large consumers ultimately goes into effect in this instance, or is washed out by winter rains, is academic in comparison with the precedents laid down in preparing for the imposition of restrictions.

Perhaps the most significant conclusion which can be obtained from Atlanta is that Krug and his staff take complete charge of the operations. OPM Priorities Director Nelson, who acted upon Krug's recommendations, maintained a hands-off policy in the Southeast while the Federal Power Commission carried on its voluntary pooling efforts to avert a shortage. But when it became apparent that pooling alone could not avert a crisis, OPM stepped in and took over not only direction of the pooling of generation but also allocation of energy.

FPC is not represented on Krug's staff at Atlanta; the chief dispatcher added to the staff to supervise the Southeast pool under OPM operation is C. W. Mayott, borrowed from his post of dispatcher for the Connecticut Valley power exchange.

Bigger Inflow of Energy

In taking over the pooling arrangements, however, Krug and Mayott have not sought to usurp control over utility operations beyond setting minimum levels of deliveries into the shortage area—Georgia, Tennessee, Alabama and parts of Mississippi, Florida and South Carolina.

Biggest achievement of the Atlanta field office, in Krug's opinion, has been the perfection of FPC's pooling arrangements. Determined to squeeze the last kilowatt-hour transmission lines would carry into the dry region, Krug and Mayott now are getting in excess of 41,000,000 kw.-hr. weekly from the Carolinas and the Appalachian system, from Kentucky, from Florida and from the Arkansas-Texas-Louisiana pool. This is 10,000,000 kw.-hr. more than deliveries before OPM took charge, 5,000,000 kw.-hr. more than even Krug's staff originally counted upon.

Much of this increase comes from getting, simultaneously, large blocks of continuous energy through both the Greenville-Tallulah Falls and the Saluda-Augusta lines tying the Carolinas and Georgia. Even FPC's recent order directing additional deliveries by Duke Power Co. did not contemplate operation of these lines in parallel. Krug and Mayott set their sights higher, insisted upon loading the lines to the hilt and helped the utilities so to arrange their operations as to minimize transmission load fluctuations, thus permitting the greater deliveries with the least chance of tripping.

Transmission connections are considered to be stronger than the more famous British Grid, but the Atlanta experiment is showing that there is a definite point of diminishing returns in mass transferring of energy. Line losses from the Southeast pool are running about 30 percent, and while it is true that additional lines in strategic places could be utilized to bring more power into the emergency region, the penalty would be high.

No Interference

Internal operation of the Carolinas-Virginias-Ohio pool feeding these two 110-kva. lines, as well as operations of other pools sending power into the threatened area, is left to the companies themselves. By choice, Mayott is largely a trouble-shooter and coordinator rather than actively a dispatcher.

All this points up Krug's method of approach to a power shortage condition. Until energy allocation appears inevitable, FPC carries the ball. Then, even when OPM moves in, first efforts are made to stretch the supply so as to delay, minimize or avoid entirely the impending curtailment. This applies, of course, to rationing which hits industrial operations, payrolls and business directly, rather than to the comparatively mild blacking out of sign, display and decorative lighting which was put into effect as soon as Krug set up shop in Atlanta.

In the blackout range, perhaps even more than the savings which result, the psychological angle is important. Krug recognizes that where employers and employees are going to be hit financially, ornamental lighting must be turned off first or become a "red herring" target of attack upon the broader program. The textile worker facing loss of two days' pay

a week can't understand why a night football game or a gayly lighted store window should use the "juice" which would run his loom.

Assuming all other devices fail to meet the problem and rationing does have to be imposed, Krug's set-up at Atlanta is geared for as much voluntary cooperation as is possible. The teeth are there to enforce the rules laid down, but the emphasis is on willing compliance.

When Krug and his aids reached Atlanta they had only Nelson's order requiring power pooling, the blackout, and the 30 percent industrial and commercial curtailment, as well as a list previously obtained from utilities of consumers using more than 10,000 kw.-hr. monthly—plus a delegation of authority to take the necessary steps to implement the edict. They had neither precedents nor adequate facilities, not even enough office space, for formally notifying dozens of utilities and municipal distribution systems and thousands of consumers what was required of them.

Fast Work

By slashing a maximum of red tape, by improvising administrative machinery as they proceeded, by putting in sixteen-hour days (literally), by delegating responsibility and work to both utilities and consumers, they fashioned a working routine in three or four days.

Utilities were assigned to put into effect and police the blackout provisions. They were instructed to acquaint personally all commercial and industrial consumers with the order's requirements, to issue warnings to violators. Where warnings went unheeded for 24 hours service was to be discontinued.

For the most part utilities used their commercial forces to contact customers and explain the blackout provisions. As can readily be appreciated, there developed a thousand and one detail questions of what lights came within the prohibited scope, what didn't. Probably some of the decisions were arbitrary, but decisions were made, in discussions between Krug's aids and the utilities. Marquees can have "sufficient light" to conduct business and for pedestrian safety—usually interpreted as a half-dozen more or less small wattage bulbs. For gasoline stations it was recommended that not more than 150 watts be used for each pump—to light driveways, not to attract business.

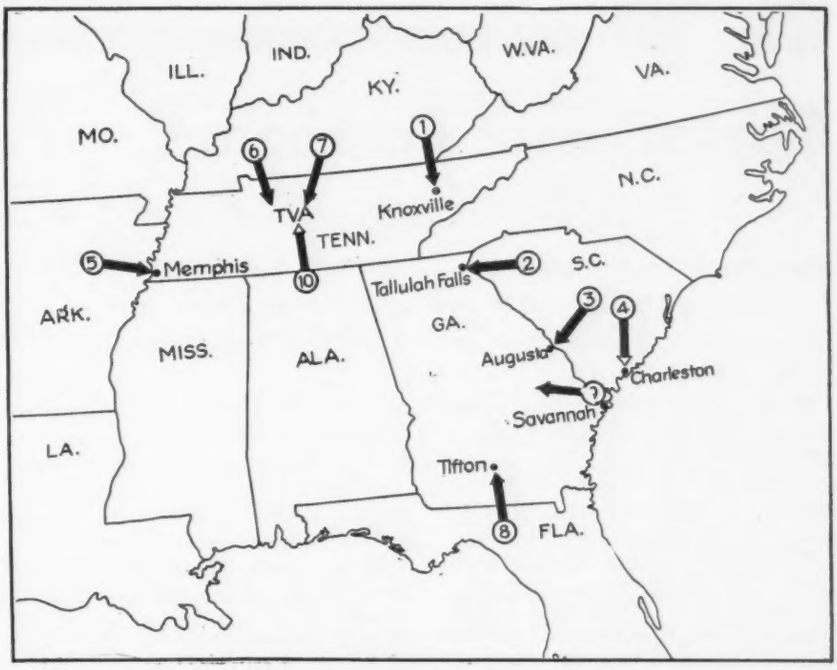
No exceptions were made for signs or other devices to attract trade. Outdoor advertising representatives made a special plea, without success, although Krug admitted the order worked a particular hardship in their case.

In the first week of the blackout only a handful of formal warnings were served, no disconnections reported. Almost universal procedure where violations were noticed was for utilities to send around a representative to discuss the matter with the customer, and compliance practically always followed.

From its lists of consumers of more than 10,000 kw.-hr. monthly (the dividing line for percentage curtailment), Krug's staff sent letters directly to those tentatively classified as exempt, inclosing forms for formal application for that status. Lists of consumers not exempt went to utilities, which calculated weekly quotas. Unlike an income tax blank, the form designed for use by utilities in notifying consumers of their weekly quotas is simple and specific—it states the consumers' kilowatt-hour consumption in the base period (meter reading between September 15 and October 14), number of days covered by this metering, average kilowatt-hours per day, average seven-day consumption, allocation percentage to be permitted under curtailment, the individual weekly quota.

Provision was made for weekly meter readings by consumers, so that they could be held legally responsible for accurate reports. These weekly readings go to utilities for checking against assigned quotas. Where quotas are exceeded, utilities are instructed to make daily meter checks

[*Continued on page* 116]



OPM Power Branch steps up power deliveries into the shortage area of the Southeast. First column of killowatt-hours shows deliveries during week ended October 25 and second column is of OPM estimates for deliveries which are now being maintained.

Into	From	Millions of Kw.-Hr.	
1. Knoxville, Tenn.	Carolinas-West Virginia-Virginia-Ohio Power Pool	9.6	9.1
2. Tallulah Falls, Ga.	Carolinas-West Virginia-Virginia-Ohio Power Pool	3.8	8.0
3. Augusta, Ga.	Carolinas-West Virginia-Virginia-Ohio Power Pool	0.6	5.0
4. Charleston, S. C.	Carolinas-West Virginia-Virginia-Ohio Power Pool	0.0	*1.5
5. Memphis, Tenn.	Louisiana-Texas Power Pool	4.5	5.5
6. TVA System	Kentucky Utilities Co.	5.5 }	7.1
7. TVA System	Kentucky-Tennessee Light & Power Company	0.6 }	
8. Tifton, Ga.	Florida Power Corp.	2.5	2.5
9. Georgia Power System	Savannah Electric & Power Co.	0.0	†2.0
10. TVA System	TVA customers' plants	0.7	0.7
	Totals	27.8	41.4

* Up to and as needed by South Carolina Electric & Gas Co.
† Line to be completed November 15.

NEWS OF THE WEEK

Curtailment Postponed in Southeastern Area

Strengthened pooling operations, delivering in excess of 41,000,000 kw.-hr. per week, and rainfall in Tennessee Valley result in postponement of 30 percent power-rationing plan

A three-way parlay of one good rain, increased energy deliveries through transmission lines and savings in consumption from blacking out signs, display and ornamental lighting paid off to give the Southeast a week's respite from OPM's 30 percent industrial power curtailment program. Chances are strong for a second week's postponement to November 24.

Rains over the Tennessee Valley on the eve before scheduled imposition of the 30 percent cut in energy use by consumers of more than 10,000 kw.-hr. monthly added an estimated 62,000,000 kw.-hr. to the storage and run-of-river generation in the shortage region —Georgia, Tennessee, Alabama and parts of South Carolina, Mississippi and Florida. This is nearly equal to required drawdown from reservoir storage in a week of uncurtailed operations.

In addition, the blackout provisions of the curtailment program were estimated to be cutting weekly consumption by more than 3,000,000 kw.-hr.

But it was the strengthening of pooling operations to step up materially deliveries of energy into the area from neighboring states which played the biggest part in deciding the toss for postponement of the percentage curtailment program.

Transmission line deliveries into the area from OPM's mandatory pooling of all facilities now are running in excess of 41,000,000 kw.-hr. weekly, compared to a high of about 30,000,000 kw.-hr. under the voluntary pooling set up by the Federal Power Commission.

Biggest block of this power is feeding into Georgia, mostly for transmission into TVA lines to keep Aluminum Company of America plants running through parallel operation of the 110-kv. lines into Tallulah Falls and Augusta, the former at 50,000 kw. continuous load and the latter at 30,000 kw. continuous load. Energy for feeding these ties comes from pooled operation of utility systems in the Carolinas, Virginias and Ohio. Parallel operations were inaugurated at 11:26 a.m. November 7. For the first 24 hours deliveries averaged 53,750 kw. into Tallulah Falls, 29,750 kw. in Augusta and, in succeeding days, this flow was increased and hourly variations lessened.

This same pool is pouring more than 9,000,000 kw.-hr. weekly additional energy directly into the TVA system over the Waterville-Knoxville tie. Other deliveries continued from the FPC pooling, but for the most part increased, are 2,500,000 kw.-hr. weekly from Florida, 5,000,000 kw.-hr. weekly from an Arkansas-Louisiana-Texas pool, 7,100,000 kw.-hr. weekly from Kentucky utilities and 700,000 kw.-hr. weekly from TVA customer plants. Completion of a tie line connecting Savannah with Georgia Power Company, scheduled by November 15, will permit sending another 2,000,000 kw.-hr. weekly into the shortage area from that system.

•

Ceiling Placed on Power Consumption

Effective Monday, November 17, those power customers in the Southeastern states subject to the restriction orders of OPM must not exceed, for the balance of this month, the rate of usage which was recorded on their meter readings taken during the "base period" of September 15 and October 14.

The new order places a ceiling on power usage, limiting it until December 1 to 100 percent of the base period.

When a week's respite from the 30 percent cut was granted power customers increased their usage above normal level.

•

Thirty Millions Asked for Bonneville Lines

President Roosevelt has asked Congress to appropriate $30,000,000 for additional transmission facilities at Bonneville Dam and stated in a letter to Speaker Rayburn that they were necessary immediately "to meet defense demands."

"A critical power shortage in this area is now imminent," the President's letter stated, "and the existing transmission facilities of the Bonneville Power Administration are being used to full capacity without any reserve."

•

Three-Man Board to Arbitrate in St. Louis

The controversy between the Union Electric Co. of Missouri and 3,000 employees who are members of the independent Tri-State Utility Workers Union will be heard by a three-man arbitration board.

The company had suggested that an agreement be signed with wage scales similar to those recently negotiated with the A. F. of L. operating engineers, with larger increases to workers in the lower income brackets. The union asked for flat 10 percent increases for all members and threatened to call a strike.

New Financing Program for Connecticut Utility

Connecticut Light & Power to issue 336,088 shares of new 5½ percent preferred, providing $10,000,000 of new capital, sufficient for next three years

President C. L. Campbell of the Connecticut Light & Power Co., Waterbury, announced a $10,000,000 financing program last week to be applied largely for additional generating facilities to meet future demands occasioned by the national defense undertaking. These facilities include two 45,000-kw. turbo-generators for the Devon steam plant, which will bring the present capacity of this station to 284,145 kw. The first of these Westinghouse units, now being installed, is expected to be in operation by the fall of 1942, while a second unit is planned for operation late in 1944. Two Combustion Engineering boilers are now on order for Devon, each rated at 225,000 lb. per hour, designed for 950 psi. and 900-deg. generation, and bituminous coal is to be burned.

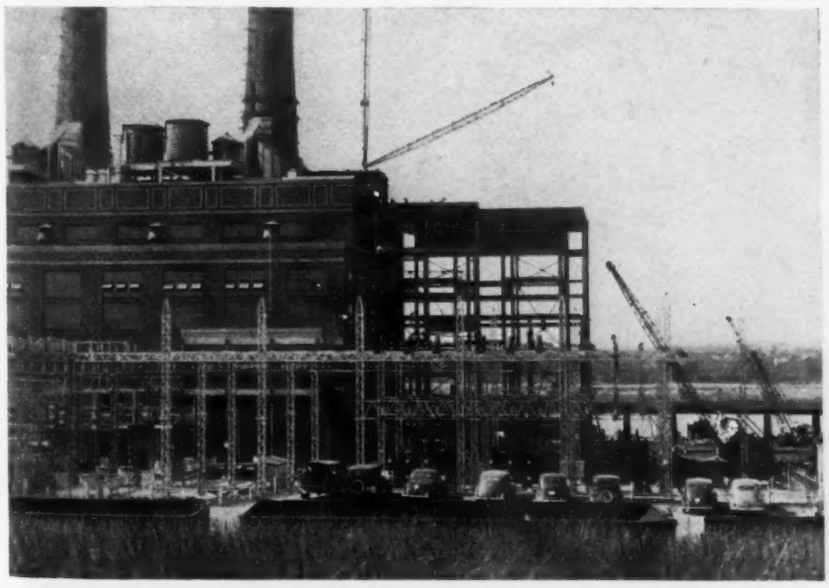
New Preferred

The financing program calls for the retirement of the company's outstanding 68,044 shares of 5.5 percent preferred stock, $100 par value, and the raising of $10,000,000 in new money. The company proposes to issue 336,088 shares of new preferred stock which will have no par value, but which will have a liquidating value of $50 a share. A total of 136,088 shares of this will be issued, bearing a dividend rate of $2.25 per year, and it will be offered to present 5.5 percent preferred-stock holders on a basis of two shares of new stock for one share of old stock.

Such shares as are not taken up under the exchange offer, together with the 200,000 additional shares to be issued, will carry a cumulative $2 dividend per year and will be sold to underwriters for cash. All old preferred stock not exchanged will be called for redemption March 1, 1942, at $112 and accrued dividends.

Of special interest to common-stock holders are the savings which will be obtained through the present tax laws. With the retirement of the 5.5 percent preferred stock, together with the tax savings arising out of credit for new capital, the combined saving will approximately offset the increase in preferred stock dividends necessary to raise the new money and will not apparently reduce the earnings available for the common. Thus, even before application of operating savings resulting from the installation of the new generating units, the company under this program is able to obtain $10,000,000 of new money without dilution of common stock earnings. Beyond this, both of the new units are to be more efficient than the older units now in operation at Devon, being capable of effecting substantial savings in fuel consumption.

The last time that the company raised new money was in December, 1938. President Campbell believes that the raising of the $10,000,000 now required will provide ample funds for the company's needs for another three years. Upon completion of the plan, the company will have outstanding not more than 336,088 shares of the combined issues of $2 and $2.25 preferred stock and will have more than $10,000,000 in new cash on hand to meet construction requirements.



DEVON PLANT EXTENSION—Addition to Devon generating plant will house new boilers and two 45,000-kw. turbo-generators. One will be in operation by next fall, the second late in 1944

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Eicher Sees Need to Link Power Islands

Edward C. Eicher, chairman of the Securities and Exchange Commission, stated last week that the commission was accelerating the geographic integration of public utility holding companies to facilitate the interconnection of "islands" of power for defense. Furthermore, he said, the commission is cooperating in strengthening the financial structures of operating companies to promote sound financing of utility concerns for defense power construction.

In many defense areas, such as Ohio and Connecticut, Commissioner Eicher said that power supply of vital armament industries is broken into islands of separate utility operating companies owned or controlled by several holding company systems. Interconnection of these islands would result in a more efficient concentration of power resources for defense, he said.

As months may elapse before integration may be completed, Mr. Eicher said, the commission is assisting the operating utility companies to arrange sound financing programs necessary to carry out expansion of facilities.

•

Westerly Plant Allowed

The Westerly (R. I.) Zoning Board of Review has approved plans and issued a permit to the Narrangansett Electric Co., Providence, for the construction of the $2,500,000, 20,000-kw. steam-generating plant on the Westerly-Watch Hill road mentioned in ELECTRICAL WORLD, August 9, 1941, page 84.

Property holders had objected to the location of the plant, but the permit was granted because the board held that public convenience and welfare would be substantially served and the appropriate use of neighboring property would not be substantially or permanently injured.

Utility Must Serve Metallurgical Unit

Federal Power Commission has ordered the South Carolina Power Co. and its affiliated companies (Georgia Power Co., Alabama Power Co., Mississippi Power Co. and Gulf Power Co.) to deliver to Pittsburgh Metallurgical Co. at Charleston, S. C., the power and energy necessary to operate three electric furnaces of approximately 2,000 kw. capacity each. The order also directs South Carolina Gas & Electric Co. to make available any transmission facilities necessary to consummate the delivery of power and energy to South Carolina Power Co. for the metals plant. The plant is operated 24 hours a day, seven days a week.

The order expressly stipulates that no part of the energy required to be delivered by its terms shall be diverted from or supplied from energy which the commission ordered the Duke Power Co. to deliver to the Tennessee Valley Authority via facilities of Georgia Power Co. and South Carolina Electric & Gas Co. on October 21.

South Carolina Power Co. has heretofore been delivering the energy necessary for the operation of two electric furnaces of approximately 2,000 kw. of capacity each. The new order requires the company to continue to supply these two furnaces and, in addition, a third furnace of 2,000 kw. capacity just placed in operation.

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Timely Advertising by Central Hudson

Appliances which require a minimum of metal or other scarce materials, comparisons between the price of eggs and the "price" of electric service and a delivery service for electric bulbs are subjects being stressed currently in advertising of Central Hudson Gas & Electric Corp., according to Harris E. Dexter, vice-president.

Among the appliances featured are the electric blanket which requires very little of the material difficult to obtain; a small 2-gal. water heater, which uses a minimum of material to manufacture, and the Nesco Chef, which has only one electric top cooking unit and only one oven unit, Mr. Dexter said.

Speaking in terms easily understood by customers, the advertising series points out that for the price of a package of cigarettes the customer may cook electrically for three days, for the price of a dozen eggs may cook five days and for the price of seven quarts of milk may cook electrically for three weeks.

The lamp delivery service is operated through mailing pieces sent to the customer by the company. A postcard order blank may be mailed without charge to the company, which passes the order along to dealers, who deliver the lamps without extra charge.

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House Gets Harbors Bill

Representative Mansfield of Texas introduced this week a general rivers and harbors bill approved last week by the rivers and harbors committee, of which he is chairman. The measure would authorize but not appropriate for works estimated to cost $1,000,000,000. Among them are the St. Lawrence seaway and the Florida ship canal.

NEWS BRIEFS

INDIANAPOLIS POWER & LIGHT CO. OFFICIALS have announced that bills to customers will carry the emblem of the Army's Aviation Cadet Corps to stimulate enrollment. The arrangement is intended to popularize the army's urgent need for student pilots and to keep the need ever before the public, officials said.

ALICE BAKER, home-lighting adviser from the Portage district of Wisconsin Power & Light Co., was recently crowned National Sweet Corn Sweetheart at the Hotel Sherman, Chicago. Miss Baker, who won over contestants from five other states in the sweet corn area, reigned for a day over the sweet-corn festival at Hoopeston, Ill.

TO MEET REQUESTS for information on priority rulings and regulations, the Electric Association of the Niagara Frontier has established a committee of five which will (1) collect all available information, (2) send out bulletins on the most puzzling ratings, (3) keep contact with the OPM for information regarding specific questions of interest to the association.

RECOGNITION OF NEW RESPONSIBILITIES was shown by employees of the East Peoria and Liberty Street generating stations of Central Illinois Light Co., Peoria, who recently signed a "declaration of intent" pledging to (1) perform their individual duties so as to insure service to homes and industries of Peoria at all times, (2) conserve materials for use in defense industries and (3) refrain from discussing work or station conditions that might furnish information to those interested in slowing defense effort.

Utility Loses Ruling on Kettle Falls

Judge Lewis B. Schwellenbach in federal court in Spokane recently decided against the Washington Water Power Co. and in favor of the United States government's contention that no power site value can be included in the condemnation award for the company's Kettle Falls land that was submerged by the Grand Coulee Dam backwaters.

Judge Schwellenbach pointed out the similarities between this case and the Continental Land Co. case, in which the Circuit Court of Appeals had held that no power site value can attach to land, since such value depends upon the bed and flow of a stream which are owned only by the state and federal governments.

He said he was bound by that decision and that no one but the Court of Appeals has the right to differentiate between the circumstances upon which that decision was based and any vitally different circumstances that might be found in the Kettle Falls case.

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Instructions Issued for Project Ratings

The Power and Communications Branch of OPM has issued instructions to utility companies as a guide in applying for project preference ratings.

A project application is expected to cover all elements necessary to the effective use of the construction. For example, an application covering a transmission line should include switching equipment and transformers and all appurtenances and accessories necessary to its use.

Eleven specific points are covered in the instructions. In case of necessity, applicants may ask at a later date for preference ratings on individual elements of the project higher than that assigned to the project submitting such requests on form PD-1.

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Magnetic Drive at Mystic

A large magnetic variable-speed drive has been ordered by Boston Edison Co. for application to an induced-draft fan in the new Mystic station at Everett, Mass.

The Electric Machinery Manufacturing Co. magnetic drive will be rated 1,250 hp., 858 to 90 r.p.m. and will be operated by a 1,250-hp., 885-r.p.m. squirrel-cage induction motor. Consulting engineers on the project are Jackson & Moreland of Boston and New York.

Pacific Coast Meeting Talks Sales, Operations

Five hundred attending Pacific Coast Electrical Association sessions at Fresno discuss sales outlook and new operating and construction problems caused by allocations and priorities

Running the gamut of subjects from responsibilties and opportunities for a sales department in the present emergency to problems of operation and construction in the face of priorities and material allocations, the program for the annual fall conclave of the Pacific Coast Electrical Association kept almost 500 electrical men busy for two days at Fresno, Calif., November 6 and 7. Business development, operating economies and administrative service sections held separate conferences.

Pointing out that there never has been a depression, war, economic upheaval or national emergency but what the electrical industry has emerged more vigorous, prosperous and replete with opportunities, association president George C. Tenney called for renewed energy and initiative. C. W. Kellogg, E.E.I. president, reminded those present not to forget that in customer and public relations the utility business is essentially a local business.

Interconnected Systems

Engineers and operating men studied problems relating to operation of the interconnected systems in California, particularly in the light of recently completed ties. Described were new tools and techniques for hot line insulator cleaning and for detecting whether a line is live or grounded. Experience was reported on emergency operating procedure in steam plants in case of a boiler failure. Effect of procurement of materials and equipment on plant operation and maintenance practice indicated an increasing incidence of headaches due to priority rules and their interpretation. Strict compliance with priority regulations was urged.

Difficulties caused by material and appliance shortages were taken up by the lighting, power, agricultural, wiring and merchandising groups of the Business Development Section under E. G. Stahl, chairman. A new 200–300–500-watt floor lamp design evolved by Art Miller, P.G. & E., San Francisco, exhibited a new range of load-building possibility.

Power and agricultural committeemen looked toward a greater industrial shift to the west coast and complained that agriculture, though told to increase production to feed the world, was not classed as a war industry nor permitted machinery to do the job. Appliance men searched the horizon for self-preservation in new appliances or repair and reconditioning to fill the void made by OPM appliance curtailments. Wiring group men, remembering the long pull uphill to create adequate wiring acceptance, were earnest in advocating continued promotion even if materials to wire are not now available.

Lane Webber, tax counsel, Southern California Edison Co., spoke of the tax cancer that threatens even to outgrow the body politic and eventually to destroy freedom itself. A. B. Smedley, Anaconda Wire & Cable, Los Angeles, treated of the industry's nerve system, wiring.

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OPA Asks Elimination of Range Cover Lids

The Office of Price Administration has asked stove manufacturers to eliminate steel cover lids from domestic cooking ranges. The stove tops, usually finished in a baked enamel, are used to cover the cooking surface when the stove is not in use.

It was stated that compliance with this order will reduce production costs and at the same time will make available some 2,500 tons of steel annually for uses which are considered to be more essential to the defense effort.

AT PACIFIC COAST MEETING—Among the 500 attending the annual fall conclave of the Pacific Coast Electrical Association were: Left to right (at top) H. C. Rice of Southern California Edison, E. G. Stahl of Pacific Gas & Electric (San Joaquin Division), Stanley W. Scarfe of General Electric Co.; (bottom left) O. R. Doerr of Pacific Gas & Electric, Harvey Edmund of Coast Counties Gas & Electric and Lewis A. McArthur of Pacific Power & Light Co.; (bottom right) R. G. Kenyon and Lane Walker of Southern California Edison and L. C. Rausch of the Coast Counties Gas & Electric Company

Large Group Attends Fluorescent Meeting

Since fluorescent lighting came into existence three years ago it has been bought by customers rather than sold by the lighting industry, E. E. Potter, general sales manager, General Electric Co., Nela Park, told more than 4,000 utility men, electrical dealers and contractors attending a fluorescent lighting conference in New York City last week.

The meeting was one of 60 now being held by G.E. in principal cities to present the status of fluorescent lighting and its possibilities, and was said to be the largest electrical trade meeting held in the New York area.

Mr. Potter estimated fluorescent tube sales would total 21,000,000 this year, 35,000,000 in 1942 and probably 65,000,000 in 1943. Production efficiency is being increased, he said, and can be passed along in lower prices.

Willard C. Brown, executive engineer at Nela Park and I.E.S. president, showed typical fluorescent applications and a new 3-kw. mercury lamp now near the marketing stage and to be used for lighting large areas. Small fluorescent lamps, included in a display of 64 fluorescent types, Mr. Brown said, will be seen soon on office equipment and in other applications.

Matthew C. Luckiesh asked his audience to consider lighting not as a means of dispelling darkness but as a competitor of daylight. The ideal illumination for offices is 300–400 ft.-candles, he said, and 100 ft.-candles will in a few years prevail for ordinary applications.

H. Freeman Barnes, manager sales promotion department, spoke on the elements of a retailer's sales program and demonstrated potential business for fluorescent business.

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Tacoma to Build 156,000-Hp. Unit

Federal Power Commission has authorized issuance of a 50-year license to the city of Tacoma, Wash., for construction, operation and maintenance of a 156,000-hp. hydro-electric project on the Nisqually River in Thurston, Pierce and Lewis counties, Wash., affecting lands of the United States within the Snoqualmie National Forest. The order states that energy generated by the project will be used for various public purposes, industries and for municipal power and light in and near the city of Tacoma.

The new project will consist of (1) an upstream development consisting of a concrete arch dam about 300 ft. high, to be known as the Alder Dam; a storage reservoir of about 147,000 acre-feet usable capacity; a power house having installed capacity of 69,000 hp.; a switchyard, and a 110,000-volt transmission line extending to the switchyard of (2) a downstream development, consisting of a concrete gravity diversion dam about 200 ft. high, to be known as the La Grande Dam; a regulating reservoir of about 10,000 acre-feet capacity; a 6,500-ft. concrete-lined tunnel, 14½ ft. in diameter; a power house having installed capacity of 87,000 hp.; a 110,000-volt transmission line about 34 miles long to the Tideflats substation of Tacoma, and appurtenant facilities.

The order also directs that, after the first 20 years of operation under the license, 6 percent per annum shall be the specified rate of return on the net investment in the project for determining surplus earnings, in accordance with the provisions of Section 10(d) of the Federal Power Act, for the establishment and maintenance of amortization reserves to be held until the termination of the license or, in the discretion of the commission, be applied from time to time in reduction of the net investment in the project. One-half of all surplus earnings in excess of 6 percent per annum received in any calendar year, the order states, shall be paid into and held in amortization reserves.

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Ickes Coal Co-ordinator

President Roosevelt announced last week that Harold L. Ickes, Secretary of Interior and Petroleum Co-ordinator, has also been named Co-ordinator of Solid Fuels.

MEETINGS

American Society of Agricultural Engineers—Fall meeting, Stevens Hotel, Chicago, Ill., December 1-3. Raymond Olney, secretary, St. Joseph, Mich.

Exposition of Chemical Industries—Grand Central Palace, New York, N. Y., December 1-6.

National Association of Manufacturers—Congress of American Industry, Waldorf Astoria Hotel, New York, N. Y., December 1-5.

American Institute of Electrical Engineers—Southern district, St. Charles Hotel, New Orleans, La., December 3-5; winter convention, New York, N. Y., January 26-30. H. H. Henline, national secretary, 29 West 39th St., New York, N. Y.

Petroleum Electric Power Association—Annual conference, Baker Hotel, Dallas, Tex., December 4-5. K. K. Kreamer, Petroleum Electric Power Association, Houston, Tex.

Louisiana Engineering Society—Annual meeting, St. Charles Hotel, New Orleans, La., January 9-10. J. K. Mayer, secretary-treasurer, Suite 422, St. Charles Hotel, New Orleans, La.

American Society of Heating and Ventilating Engineers—Annual meeting, Philadelphia, Pa., January 26-30. A. V. Hutchinson, secretary, 51 Madison Av., New York.

International Heating & Ventilating Exposition—Biennial exposition, Commercial Museum, Philadelphia, Pa., January 26-30.

Olds Holds Niagara, Seaway Complements

Redevelopment at Niagara Falls to produce additional power from the Niagara River would be a complementary second step to the St. Lawrence power and seaway project, Chairman Leland Olds of the Federal Power Commission advised Representative Alfred F. Beiter, member of the House rivers and harbors committee, last week. In a letter to the commission, Representative Beiter had recommended the redevelopment as a "substitute" for the seaway project.

Chairman Olds emphasized that all the power which can be produced from additional diversions through existing facilities at Niagara is already earmarked for defense industries and that the St. Lawrence development could be completed at least as rapidly as could a redevelopment at Niagara.

"The St. Lawrence," said Mr. Olds, "will develop the largest single undeveloped source of low cost hydro-electric energy on the North American continent, and this will be done as an adjunct to the seaway. A redevelopment at Niagara instead of the St. Lawrence, as you suggest, would eliminate the benefits of the seaway from the defense effort and the period which will follow the present emergency, and thus sacrifice the interests of millions of people in the middle western states to shortsighted and narrow interests. . . ."

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Utility Denied Review on Bluestone Project

U. S. Supreme Court this week refused to interfere with a lower court verdict approving the $13,000,000 Bluestone Reservoir project near Hinton, W. Va.

West Virginia Power Co. and Norfolk & Western Railway Co. had attacked the government effort to condemn large tracts of land for the combined power plant and flood-control works, but lost in the Fourth Circuit Court.

•

Low Water at Danville

The Talbot Reservoir, which supplies Danville with hydro-electric power, contains only 120,000,000 cu.ft. of water as compared with a normal capacity of 350,000,000 cu.ft. This is enough to supply the city with power for about 30 days. The steam plant has been put in readiness for operation and will be started up if the drought is not relieved soon. There has been no rainfall on the reservoir's watershed for 120 days.

Output Drops Off During Holiday Week

The amount of electrical energy distributed by the electric light and power industry for the week ended Saturday, November 8, was 3,325,574,000 kw.-hr., according to the Edison Electric Institute.

The decrease of approximately 13,000,000 kw.-hr. was attributable to the holiday due to elections on November 4. A year ago, when a Presidential election was under way, the decrease was 36,000,000 kw.-hr.

Output for the country as a whole increased 16.4 percent over the corresponding week a year ago, with New England in the lead among the geographical sections, showing an increase of 18.7 percent over a year ago.

Among other sections registering above average increases were Central Industrial with 18.5 percent, West Central with 17.8 and Southern States 17.3 percent.

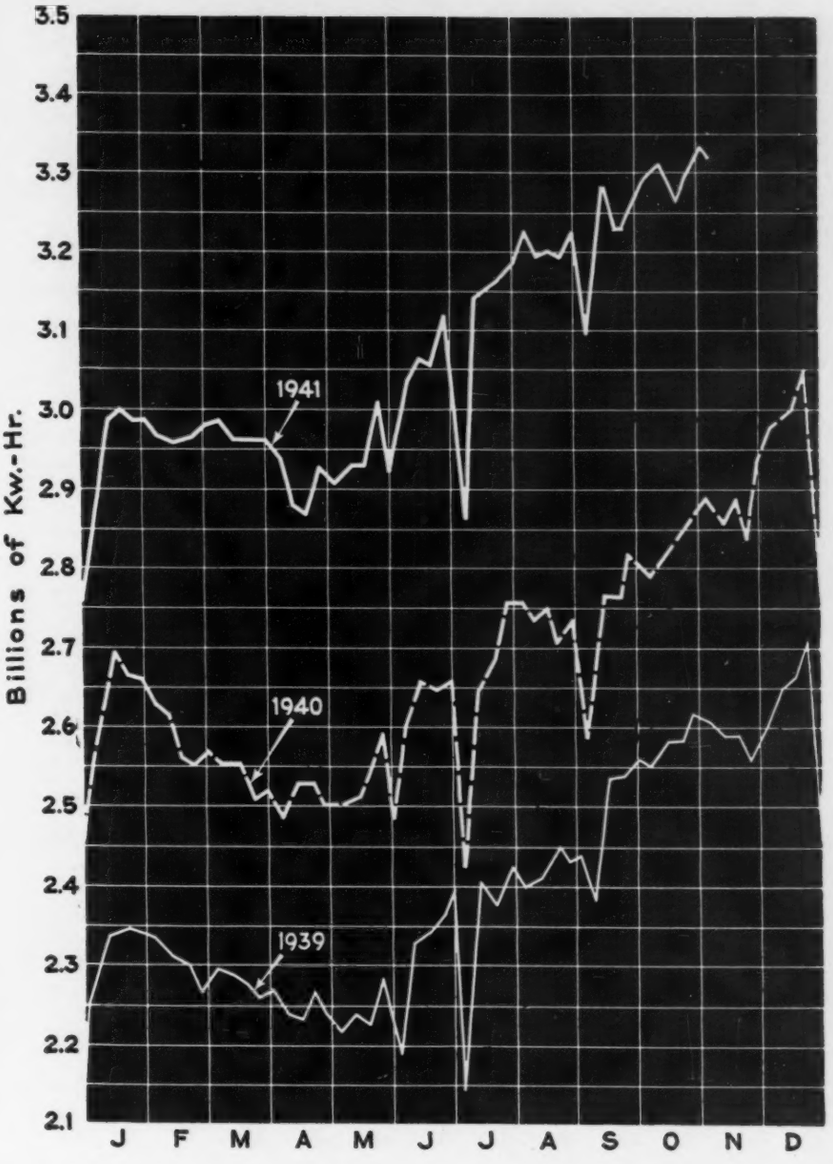
Weekly Output, Millions Kw.-Hr.

1941		1940		1939	
Nov. 8	3,325	Nov. 9	2,858	Nov. 11	2,589
Nov. 1	3,338	Nov. 2	2,882	Nov. 4	2,608
Oct. 25	3,299	Oct. 26	2,867	Oct. 28	2,622
Oct. 18	3,273	Oct. 19	2,838	Oct. 21	2,576
Oct. 11	3,315	Oct. 12	2,817	Oct. 14	2,583
Oct. 4	3,290	Oct. 5	2,792	Oct. 7	2,554

Percent Change from Previous Year

	Week Ending		
	Nov. 8	Nov. 1	Oct. 25
New England	+18.7	+17.7	+17.5
Mid-Atlantic	+14.0	+12.2	+12.2
Central Industrial	+18.5	+18.1	+17.4
West Central	+17.8	+17.5	+16.5
Southern States	+17.3	+16.4	+17.9
Rocky Mountain	+16.3	+17.7	+11.9
Pacific Coast	*+11.1	*+12.4	*+ 8.4
Total United States	+16.4	+15.8	+15.1

*Percentage should be higher — data under revision.



August Power Use Rises

Electric energy requirements for August, 1941, totaled 13,975,094,000 kw.-hr., a gain of 17.4 percent over the same month of last year, according to the report isued by the Federal Power Commission. Corresponding peak demands on the country's major utility systems aggregated 27,610,920 kw., or 13.9 percent above August, 1940.

•

Pays Customers Dividend

City of Jamestown, N. Y., which operates a municipal electric plant, has filed with the state Public Service Commission a notice of its 1941 consumers dividend under which the city refunds to consumers 20 percent of their bills for service during the year. The exact amount of the refund has not yet been determined, but it is estimated that the dividend this year will amount to about $211,000. The corresponding figure for 1940 was $190,492. The dividend is based on the earnings of the utility for the twelve months ending September 30 of each year.

•

Canadian Output Spurts

Central electric stations in Canada produced a record total of 2,866,647,000 kw.-hr. in September, compared with 2,640,084,000 kw.-hr. in the previous month and 2,399,678,000 kw.-hr. in the corresponding month last year, the Dominion Bureau of Statistics has reported. Production in the first nine months this year totaled 23,900,261,000 kw.-hr., compared with 22,483,592,000 kw.-hr. in the similar period of 1940.

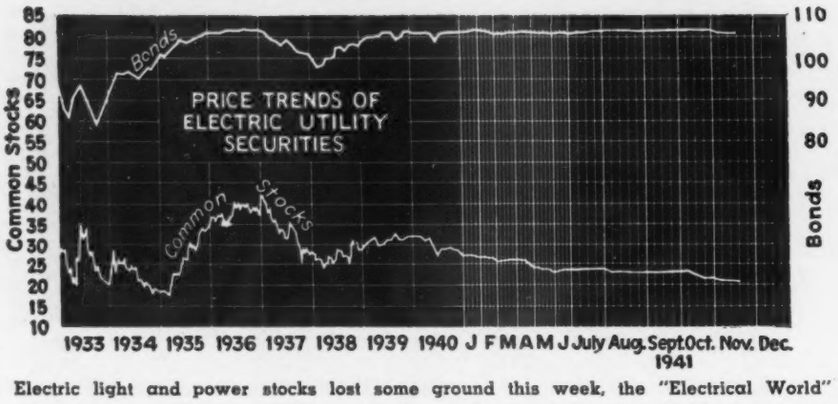
Range and Radio Prices Stabilized

Manufacturers of radios and of domestic cooking and heating equipment were requested last week by Leon Henderson, price administrator, not to advance prices on radios beyond levels prevailing October 15 and on domestic cooking and heating equipment above levels prevailing on October 24.

The action was taken to keep prices steady while a determination is made of the effects on cost in the two industries of curtailment of output due to the defense program.

The Office of Price Administration has studies under way at the present time during which it is hoped to develop long-range price programs for both the radio and range industries and meetings are planned shortly between OPA and representatives of each group.

Utility Stocks Dip; Bonds Turn Upward


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
Bonds
Common Stocks
Common Stocks
Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1933 1934 1935 1936 1937 1938 1939 1940 J F M A M J July Aug. Sept. Oct. Nov. Dec. 1941

Electric light and power stocks lost some ground this week, the "Electrical World" index dipping to 21.2 from 21.5 the preceding week; last year, 28.4. Bond index turned upward—105.7; last week, 105.6; last year, 106.1

National Power Wins Partial Dividends

The Securities and Exchange Commission acceded last week to the request of P. B. Sawyer, president of National Power & Light Co., that it permit Pennsylvania Power & Light Co., its subsidiary, to declare and pay common dividends not exceeding 25 percent of its net earnings available for the common stock after June 1, 1941.

The commission barred the payment of dividends by Birmingham Electric Co., a subsidiary, on its common stock, but limited payment on the common stock of Carolina Power & Light Co., another subsidiary, to $600,000 a year plus 25 percent of the amount by which net earnings of the Carolina company available for its common stock exceeded $1,250,000.

In the meantime the commission will hold in abeyance its corporate simplification proceedings against National Power & Light Co. until the program proposed by the management of the company has been executed.

•

Protests SEC Ruling

Public Service Corp. of New Jersey has petitioned the Third United States Circuit Court of Appeals to stay a decision of the Securities and Exchange Commission bringing it under the Public Utility Holding Company Act.

•

United Hearing Set

Securities and Exchange Commission has set down for hearing on November 17 its proceeding against the United Corporation on the ground that its operation and corporate structure infringed both the "death sentence" and corporate simplification clauses of the Holding Company Act. Petition of United Corporation that the proceedings against it be dismissed and that its own plan for divestment of control over its subsidiaries be approved was not granted.

•

Philadelphia Electric Refunding Approved

The Securities and Exchange Commission has granted an application of Philadelphia Electric Co. to issue and sell at competitive bidding $20,000,000 principal amount of first and refunding mortgage bonds, 2¾ percent series.

Proceeds from the sale of the bonds are to be utilized by the company to retire a like amount of 1½ percent notes payable to banks and maturing December 3, 1941.

The proposed issue is redeemable in whole or in part at the applicant's option upon payment of the principal amount with accrued interest, and an additional premium of 3 points over the public offering price, which is to be reduced cumulatively in each succeeding year.

•

Deny Substation Plea

Application of the Portland General Electric Co. for permission to construct a power substation on 26th Street, Vancouver, Wash., has been denied by the city planning commission.

•

Propose $52,000,000 Loans

Public Service Co. of Indiana, Inc., has filed with the SEC an application for permission to sell $42,000,000 of 3⅜ percent first-mortgage bonds, series D, due on December 1, 1971, and either to sell $10,000,000 of serial debentures or to borrow the same amount from banks or insurance companies.

•

Associated to Offer Four Properties

Trustees of Associated Gas & Electric Corp. are planning to sell by competitive bidding those major properties which will not be retained after the company emerges from reorganization. Also, it was said trustees have abandoned plans to exchange or sell these properties to other systems or to individuals.

The companies included in this plan, all of which are expected to be sold through competitive bidding, include Rochester Gas & Electric Corp., Jersey Central Power & Light Co., Kentucky Tennessee Light & Power Co. and Staten Island Edison Co.

Anticipating official announcement of this policy hinted at recently (ELECTRICAL WORLD, November 8, page 9), it is understood that at least four leading investment banking houses are considering the formation of syndicates to bid for the common stock of Rochester Gas & Electric Corp.

Following an announcement by the Securities and Exchange Commission outlining an approved form of new capital structure, the Virginia Public Service Co. has filed a reorganization and recapitalization plan with the commission which includes proposals to dissolve two wholly owned subsidiaries and merger of Virginia Public Service Generating Co.

If the plan is approved all the new securities of Virginia Public Service will be offered publicly with the exception of certain preferred stock which must be offered to holders of the company's present preferred stock.

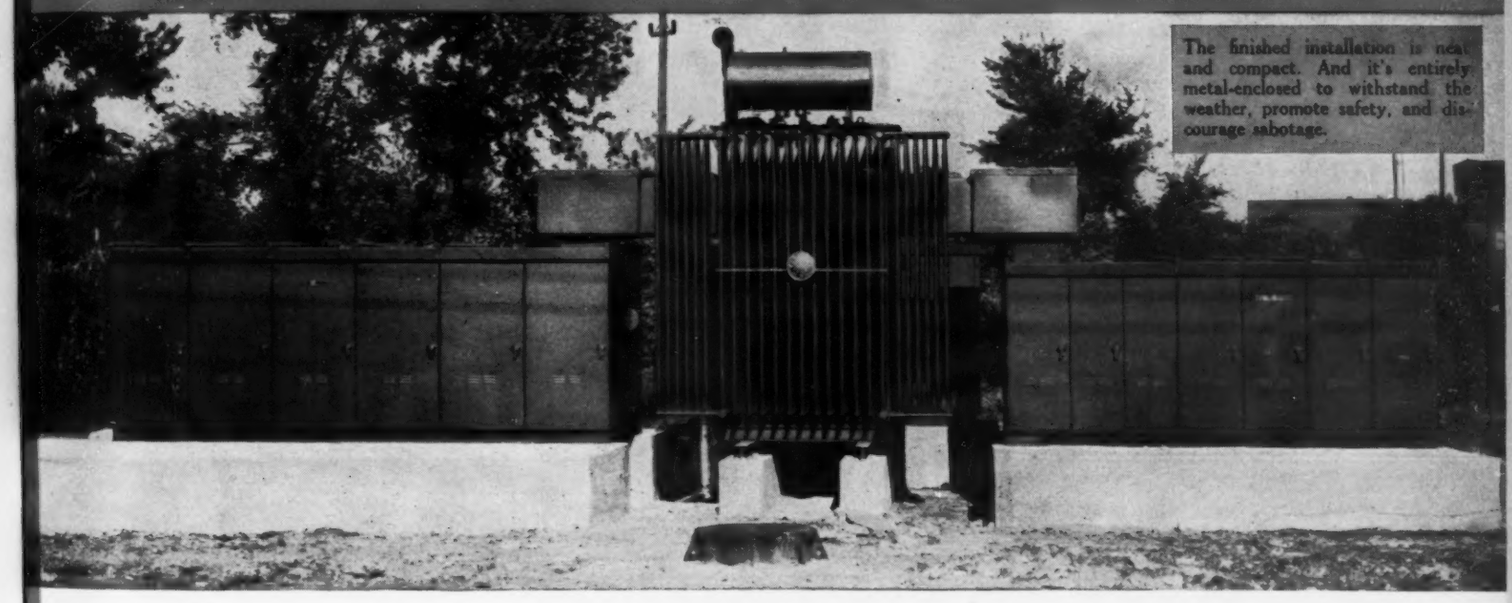
Utility Reports

	Net Income 1941	1940
*Arkansas Power & Light	$1,463,273	$1,090,985
*Commonwealth Edison and subs.	27,257,511	28,770,118
†Duquesne Light	10,501,238	10,392,007
*Electric Power & Light and subs.	6,470,836	6,850,278
*Idaho Power	1,388,101	1,499,982
*Kansas City Pwr. & Lt.	3,704,226	3,778,643
*Kansas Gas & Electric	1,556,450	1,415,596
*Louisiana Power & Light	1,100,817	1,058,353
†Louisville Gas & Elec. (Ky.) and subs.	2,789,086	2,865,682
*Minnesota Power & Lt.	1,641,990	1,383,061
*Nebraska Power	1,709,833	1,639,442
*New Orleans Pub. Serv.	2,669,291	2,664,797
*Oklahoma Gas & Electric	2,529,187	2,655,849
*Philadelphia Electric and subs.	19,974,938	22,036,276
*Wisconsin Pub. Serv. and sub.	1,740,068	1,769,438

*Twelve months ended September 30.
†Twelve months ended August 31.

Even large unit substations (such as this 3000-kva unit for the Board of Public Utilities of Jamestown, N. Y.) are easily and quickly installed—and at lower over-all cost than that of old style, piecemeal substations. The completely assembled sections (properly co-ordinated) need merely be skidded into position and bolted together. Then make the necessary connections and your unit substation is ready for service.

How to Supply Today's Loads with AN EYE ON TOMORROW



The finished installation is neat and compact. And it's entirely metal-enclosed to withstand the weather, promote safety, and discourage sabotage.

EXPAND with UNIT SUBSTATIONS

THEY not only save you installation time, space, and reduce construction requirements; they also provide *flexibility* to meet future changes in load conditions.

A G-E unit substation is delivered in completely factory-assembled, ready-to-install sections; installation is a matter of days rather than weeks. It's compact and designed for outdoor service, making a large investment in real estate and buildings unnecessary. And you can locate it *close to the load center,* so feeders are shorter, losses lower, service better.

Then when load conditions change, it's a comparatively simple matter to move your unit substation to a new load center. In short, here's the practical, farsighted answer to the changing power requirements of *today and tomorrow.* Catalog GEA-2996 or your local G-E representative will give you more information—call or write today. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

401-7-170C

OPERATING PRACTICES

Blower Device Dries 200 Gloves an Hour

Linemen's rubber gloves, which formerly required eight to twelve hours to dry after test using a conventional drying rack, are now dried in six to eight minutes using the illustrated forced-convection type glove drier developed (and patented) by J. G. Swartz, laboratory engineer of the Kansas City Power & Light Company. The rapid drying rate claimed for this drier is accomplished with a large volume of air at room temperature supplied from a motor-driven centrifugal blower. Use of air at room temperature is claimed to reduce deterioration of the rubber, due to the absence of applied heat.

The drier used by the Kansas City company has 24 glove holders, but it is capable of handling 200 gloves per hour, it is said. Glove holders are mounted on an inverted cone, which can be revolved to make all holders readily accessible in loading and unloading. Water that drains from the gloves is caught in the inner cone and can be drained at the end of the day's run.

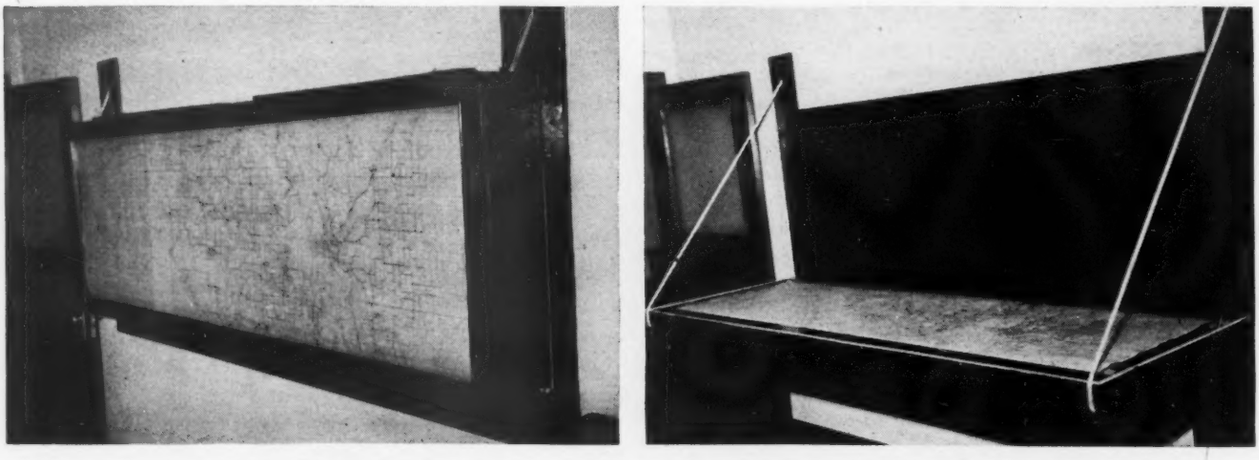
FORCED convection drier for linemen's rubber gloves

Floor space occupied by the drier is 3 ft. square. The unit shown displaced a conventional rack which occupied four times the floor space and had about one-quarter its daily capacity. Designer Swartz reports that cost of building the unit, including labor and material (and license), is approximately $175.

•

Continuous Roll Map Shows Rural Circuits

A unique one-piece roll map showing the company's complete 13-kv. rural system and identifying all customers is in daily use at the load dispatcher's office of the Nebraska Power Company at Omaha. This map, which has several noteworthy features, is 120 in. wide and in the form of a continuous belt running over 8-in. diameter tin rollers. Burlap spirals, wound in opposite directions on the rolls, grip the map and keep it from slipping. Ends of the belt map are joined by a zipper, making removal easy. The glass front case inclosing the map is hinged at the bottom and counterweighted so the whole assem-



ENDLESS ROLL MAP in normal position (left). Map pulled down to form table for making changes (right)

bly can be pulled down to form a convenient "desk" for making changes in the map. The map represents an area 85 miles in width and 85 miles long.

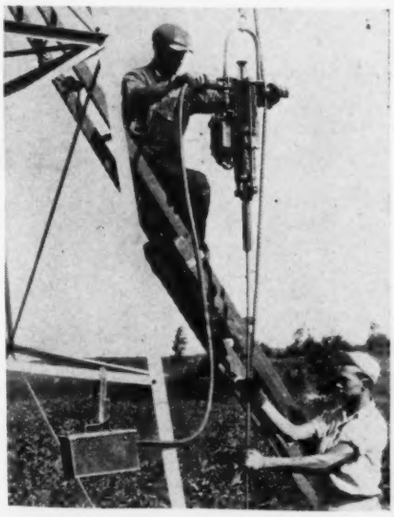
•

Ground Electrodes Installation Methods

By J. R. EATON *
Purdue University, Lafayette, Ind.

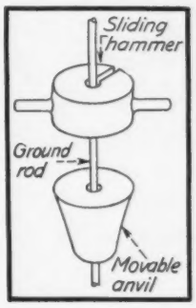
The two most effective types of ground electrodes are the driven ground rod and the buried wire or counterpoise. The methods best suited to the installation of either of these of course depends on the type of soil and the extent of the electrode system to be installed.

Ground rods 8 to 10 ft. long can usually be installed most economically by the time-honored sledgehammer. Sledging requires a minimum of driving equipment, but may require considerable time per foot of rod. A possible improvement over the sledging process is a device consisting of a chuck and sliding hammer, which has the advantage that the work may be carried on at a level convenient to the workmen without a ladder or auxiliary platform. In addition, the blow is delivered to the rod at a point not far from the ground line. With this system rods can be driven to considerably greater depths than is possible by hand sledging. Jointed ground rods are available and may be extended to considerable depths.



GASOLINE HAMMER has proved particularly advantageous for grounding transmission line towers, frequently located a considerable distance from roads and sometimes in rugged country

If the driving of ground rods is to be undertaken on a comparatively large scale it may be desirable to provide power-driving equipment. Electric hammers of small size are available, but these of course require a source of electric power. Air hammer equipment is frequently available on utility systems. These hammers, when equipped with the proper driving tools, are very effective in driving rods to almost any desired depth, but have the disadvantage that rather bulky compressor equipment must be provided near the driving operation. While this requirement is no great handicap in locations readily accessible to a truck, it may present a definite handicap when grounds are to be installed in locations remote from roadways.



SLIDING HAMMER for driving ground rods employs a chuck anvil that may be moved to any elevation on the ground rod and facilitates driving rods deeper than conventional sledge hammer methods

The gasoline hammer provides a very effective tool for installing ground rods. These hammers are available in several sizes, the larger of which will deliver blows equivalent to that of a heavy air-hammer. As the units are self-contained, and may be carried about readily, they provide ideal tools for the installation of ground rods, since the hammer may be carried to any location on a light truck. Using $\frac{5}{8}$-in. x 8-ft. rods joined by pressed-fit couplings, grounds have been installed to a depth as great as 150 ft. with this method. A crew of three men working with a gasoline hammer may drive from 200 to 400 ft. of rods per day in favorable locations.

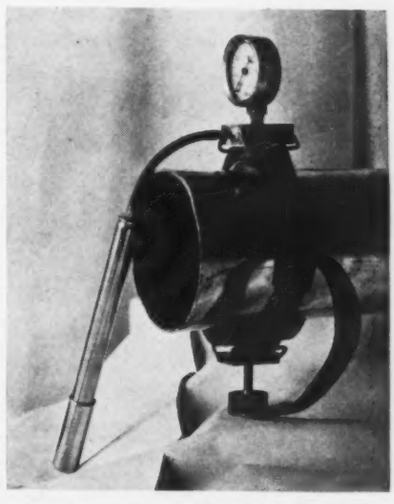
In case the ground electrode system is to be constructed of a number of horizontal buried wires (counterpoise), the most economical installation method will depend on the local conditions and the amount of wire which is to be buried. If the amount of wire to be buried is small installation can probably be made most economically by hand-trenching methods. However, if a considerable amount of wire is to be buried, power machinery may prove desirable. There are available machines of different types with which it is possible to plow wire into the ground to a depth of 20 to 30 in. These machines must be sturdily built and must be pulled by heavy tractors, usually of the caterpillar type. The speed with which they may be used depends to a great extent on the type of soil into which the wire is being placed and upon the number of roots, rocks and other obstructions which may be encountered. Under favorable conditions it is possible to plow in several miles of cable per day.

[ED. NOTE—This is the ninth and last in a series of articles on various phases of grounding.]

*Consultant for James G. Biddle Co.

•

Bicycle Pump Checks Cable Joints



DETROIT cable splicers use bicycle air pump and soap and water solution to check for leaks before filling new cable joints and potheads

The accompanying illustration shows a simple method for spotting leaks in cable joints and potheads by means of air pressure and a little soap, which is used by Detroit Edison cable splicers.

As shown, an ordinary bicycle pump and a 10-lb. gage are connected to fittings in the joint sleeve through detachable air-tight rubber adapters

which are strapped in place around the cable.

With slight air pressure, around 10 lb. psi., built up inside the joint or pothead by the pump, soap and water solution is used to locate the leaks. Underground system supervisors report that many small leaks have been found in this way which would otherwise have escaped detection and possibly resulted in future breakdown of the joint or pothead if not tested.

The equipment shown is standard for all splicers' carts.

•

Fluorescent Lamp and Starter Test Device

Required tests on fluorescent lamps and starters may be quickly made with a simple operated device in use at retail stores of Central Maine Power Company.

Equipment for making the checks is mounted within the cabinet shown in accompanying illustrations. In addition to standard lamp auxiliaries, this equipment includes three strips on which are mounted thirteen receptacle outlets and five starter receptacles. Three of the outlets (at the top of the cabinet) are used for the test lamp (25-watt, 240-volt, "A-19" clear); eight are numbered to correspond with the eight sizes of fluorescent lamps from four to 100 watts. One of the remaining two is a common outlet ("C"), while the other holds a telltale light ("TT") that indicates when the supply voltage—120 volts, a.c.— is on. A main switch (lower left-hand corner of cabinet) turns the voltage on and off.

In checking starters this procedure is followed: Test lamp is plugged into proper outlet—center outlet is used for 4- to 40-watt starters, outer two for 65- and 100-watt starters. Inserting a shorted attachment plug cap into the outlet corresponding to the starter being tested completes the circuit. When the starter functions the test lamp will flicker.

In order to test 65- and 100-watt starters, it is also necessary to insert a shorted attachment plug into the common receptacle outlet ("C") to complete the circuit, otherwise the testing procedure is similar. Toggle switches (shown beside the 65- and 100-watt starters) are placed on "2" or "4," according to the type of starter being used; these switches bypass the heating coil in the four-prong starter.

In making tests of fluorescent lamps three sets of attachment cords —two cords to a set—are used. These cords carry plug caps on one end and connectors fitting the fluorescent lamp electrodes on the other. To fit the 6-watt lamp, a special plug was made from a connector used in radio work. A standard flat-type connector is used for the 15- to 40-watt sizes, while a "Beaver" flat-iron plug serves for the two larger lamp sizes.

To test a lamp the proper cords are selected. One end is plugged into the proper outlet for the lamp being checked and the other is plugged into the common outlet. Attaching the two remaining cord ends to the lamp completes the circuit; if the lamp is good it will light up. A glow test can be made to determine if there is an air leak in the tube; the good starter is replaced with one which has been shorted across the prongs, allowing the filaments to warm up to the necessary temperature, but not causing the striking of the arc.

This fluorescent test device was designed and made by Lloyd N. Benner, district superintendent of the utility at Brunswick, Maine.

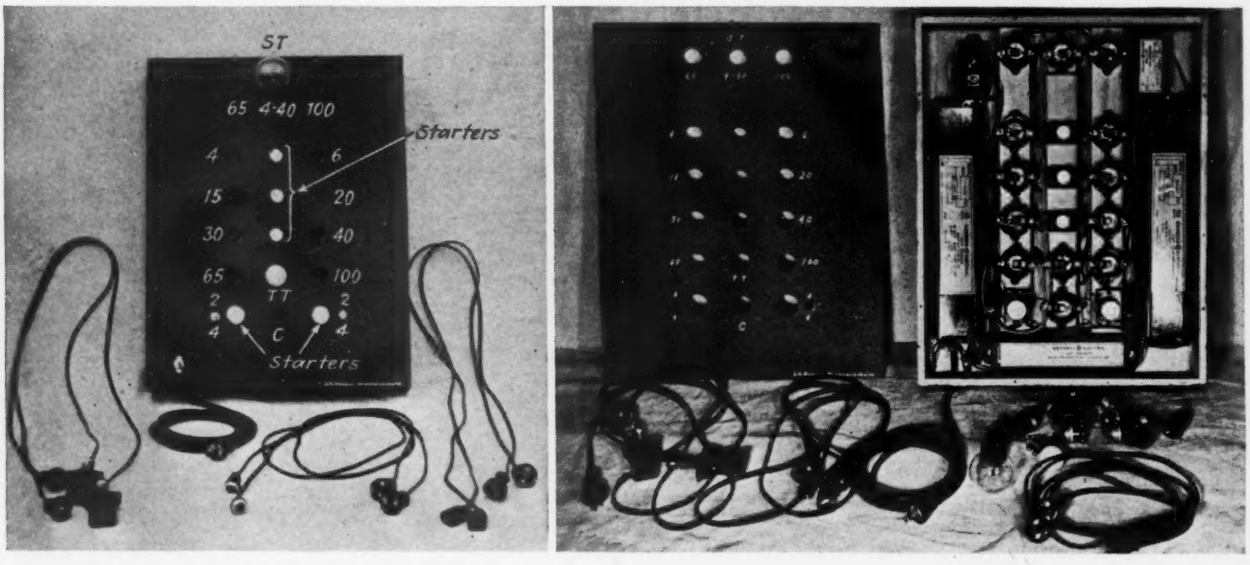
•

Service-Wire Reels Mounted on Truck

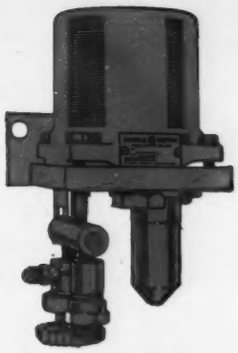
Waste ends of service wire, which accumulated when 250-ft. flat coils were used, have been practically eliminated at Long Island Lighting Company through the use of 2,000-ft. reels directly mounted on the service truck.

A shaft, extending the width of the truck and resting on triangular end supports, holds two reels, one of two-conductor No. 8 wire and the other of three-conductor No. 6. A spacer between separates the reels. The reel rig is mounted up front in the truck where it will be out of the way.

A lever arrangement helps in rolling the shaft-mounted reels into position on the shaft supports and also holds them securely.



TEST DEVICE provides quick, accurate check of all sizes of fluorescent lamps and starters. (Assembled device shown at left; component parts at right)

Whenever  THIS RELAY OPERATES *you'll save $1000 to $1500*

Because GAS-FILLED* CABLE WARNS YOU BEFORE FAILURE

*"G F"—new self-supervising cable for 10 to 40 kv

POWER COMPANY ENGINEERS tell us that the cost of repairing a cable failure averages between $1000 and $1500. Failure of solid-type paper-insulated cable occurs without warning, and the damage is done.

Now, with the development of General Electric's "G F" (gas-filled), you can get a self-supervising cable that is economical for 10 to 40 kv. If there should be a leak, the lessening of gas pressure itself will work the relay, and any time this happens you'll be saving the expense of a major cable repair—plus the intangible benefits that accrue when service interruption is prevented.

Furthermore, gas-filled cable gives you this choice:

1. You can locate and make the repair immediately before further damage, or—
2. If the warning sounds at a time when the cable cannot be taken out of service, you can valve-feed enough extra gas to make up for the leak until a more convenient time.

Two Types Available—both single-conductor and three conductor. For a copy of our descriptive bulletin, GEA-3652, or for a quotation, inquire of the G-E office near you. General Electric, Schenectady, N. Y.

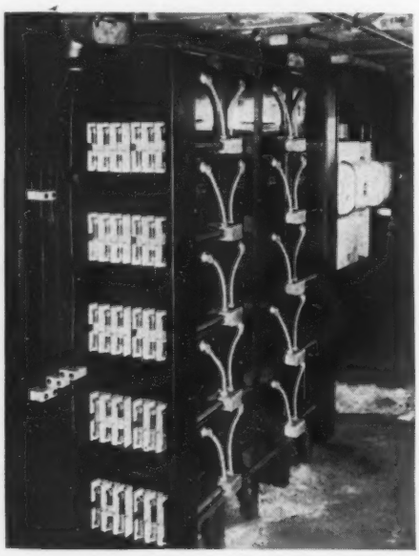
GENERAL ELECTRIC

501-6-1200

INDUSTRIAL ENGINEERING

Capacitors Alternated on Night Duty

The Stedfast Rubber Company, Mattapan, Mass., recently installed a bank of Sprague capacitors aggregating 200 kva. to improve power-factor conditions on its 440-volt, three-phase motor circuits. The equipment was mounted in a 6x6-ft.x23-in. channel steel rack made of 2x1-in. members, with a fuse cabinet at each end and switching facilities to enable alternate halves of the 20 units to be cut out of service between midnight and 7 a.m., when load is light. In the daytime all 20 units are operated.



TWENTY CAPACITORS run daytimes are halved at night to correct for lighter loads and conserve life of units

There are a number of 220-volt motors in the plant which were not connected into the capacitor bank, but under the present conditions a general improvement of power factor has been realized even with the use of 440-volt capacitor units only. A 125-hp. induction motor was installed last year on a calendar drive and the power factor was of the order of 49 percent at times before the capacitor installation. The plant consumed 70,000 kw.-hr. in a typical month before the improvement was made and with a demand charge of $636, the total billing being $1,372.

A typical month after capacitors went into service resulted in a demand charge of $548, and on account of increased business the energy consumption was raised to 85,600 kw.-hr., the total bill being $1,415. This cut of $88 in demand charge alone would pay for the installation in about two years (first cost of job about $2,500), but the plant found it of great advantage to gain 15,600 kw.-hr. in a month with a total advance in billing of but $43.

In other words the net cost of the additional energy was under 3 mills per kilowatt-hour.

Bearing Manufacturer Demands 50 F.-C.

Real story behind the lighting of a new "windowless" building recently added to the Indiana plant of a well-known manufacturer of ball and roller bearings lies in the fact that company executives demanded 50 ft.-candles before the lighting engineer had a chance to recommend it.

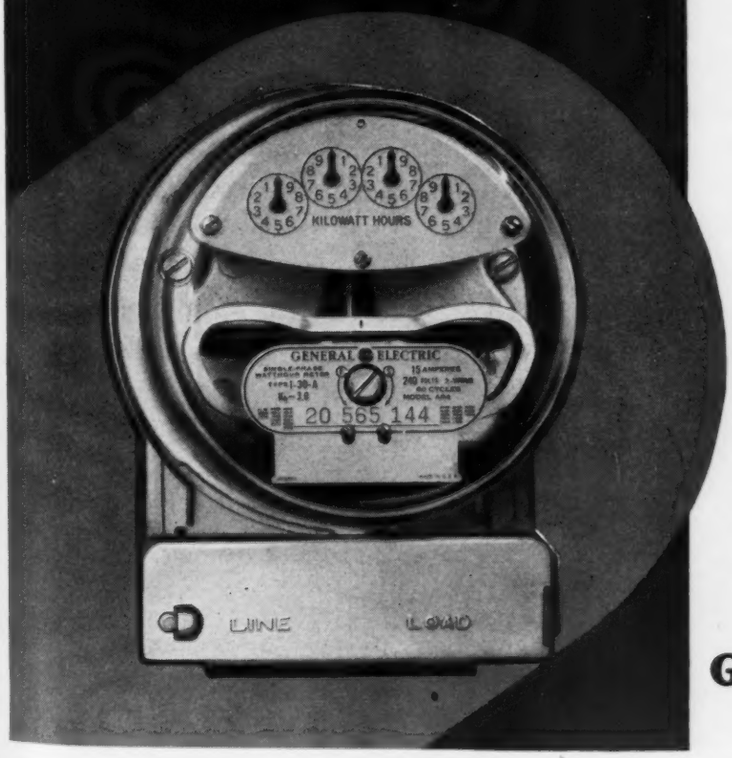
For some time the company has been inspecting and assembling bearings under a skylight in another part of the plant. Here the 50 ft.-candles of natural daylight had been found "just right" for the job. So, when Norman B. Hickox, Chicago lighting specialist, called to make his lighting recommendations for the new building to house the expanded inspection department, he was taken to the old department. Here executives paused, pointed eloquently and said, in effect: "We want you to duplicate that. It's about 50 ft.-candles and just right."

FLUORESCENT for inspection of bearings—50 ft.-candle lighting installation in pseudo windowless inspection department of bearing plant. Lighting was designed to duplicate 50 ft.-candles of natural daylight previously found highly satisfactory

WHY

Low-resistance Potential Coils?

(CLASS II TEMPERATURE COMPENSATION)



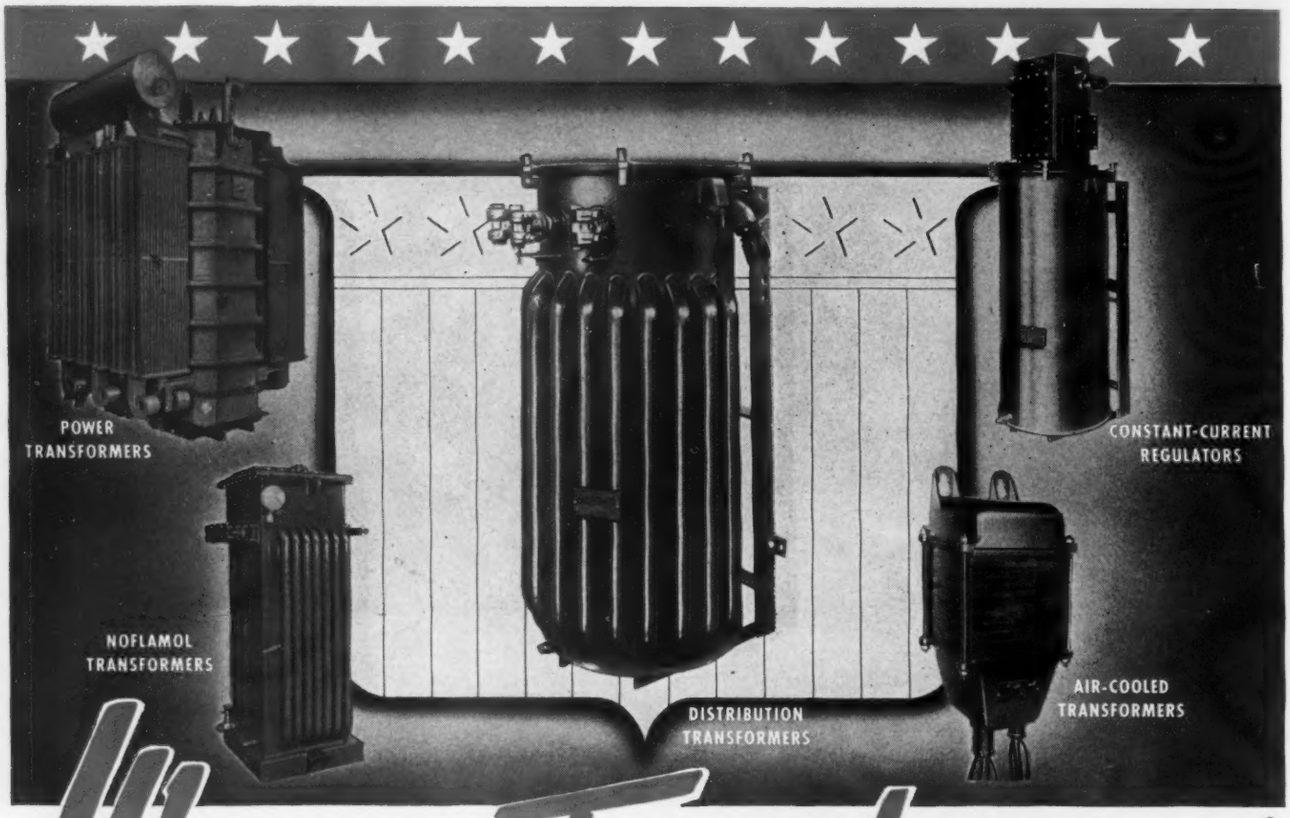
TEMPERATURE-COMPENSATED damping magnets assure constant damping flux, and are unaffected by normal temperature changes. This constitutes Class I temperature compensation that is associated with unity-power-factor loads.

However, at other than unity-power-factor loads, variations in resistance of the potential coil, due to changes in ambient temperatures, adversely affect the characteristics of the meter and cause what are designated as Class II temperature errors. While this may necessitate some compensation of the lag adjustment, such as a temperature-sensitive lag plate as in the I-30 meter, a low-resistance potential coil lessens its need. Better temperature performance is an inherent characteristic of such a coil, and the small amount of compensation required makes it possible to obtain more uniform results in the operation of the meter.

Low-resistance potential coils have characterized General Electric watthour meters for almost three decades and are a fundamental feature of the I-30 line. General Electric, Schenectady, New York.

GENERAL ELECTRIC

GEI-8-4110



Wagner Transformers

GIVE DEPENDABLE SERVICE IN DEFENSE PRODUCTION

IN defense industries .. power plants .. air ports .. government construction work — wherever the use of dependable electric power is an important factor, you will find Wagner transformers doing their part in speeding up our national defense program.

Wagner transformers, through 50 years of service to industry, have proved their ability to furnish unfailing power, and it is only natural that they should be selected for the key points of power distribution in this time of national emergency.

Wagner builds all types and sizes of power and distribution transformers including stud-bushing type; primary-pocket-stud type; sub-station and subway types; single or three phase; rural line; air cooled; Noflamol; and Type YH Constant-Current Regulator.

Because of large plant capacity, vast manufacturing facilities, and 50 years of engineering and manufacturing experience, Wagner can give immediate attention to all your transformer requirements.

SEND FOR COMPLETE LITERATURE

For complete descriptive literature on the design and construction of Wagner transformers write for bulletins TU-180 (distribution) and TU-181 (power).

WAGNER ELECTRIC CORPORATION 50TH ANNIVERSARY 1891 • 1941 ST. LOUIS, MO.

T41-14

This year Wagner celebrates its fiftieth year of service to industry and the home — as a manufacturer of transformers, motors and fans of the highest quality.

★ Wagner ELECTRIC CORPORATION ★
6400 PLYMOUTH AVE. ST. LOUIS, MO., U. S. A.

★ TRANSFORMERS
★ MOTORS
★ FANS
★ BRAKES

The job that resulted is shown in the accompanying illustration. The area to be lighted was 50 x 80 ft. with a 9 ft. 5-in. ceiling. It was in an air-conditioned, sheet metal one-story building, which for lighting purposes was "windowless." True, window sash was provided for escape purposes, but the glass was painted black. Upper walls and ceiling of the room are painted with "off white" Luminal.

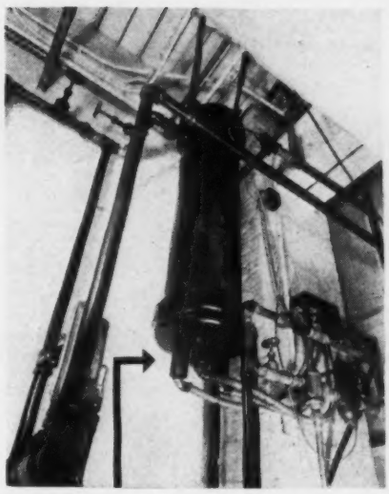
To light this area 88 open-end, trough-type fixtures, each with two 40-watt, 3,500-deg. white Mazda F lamps, were mounted 8 ft. above the floor and on 7-ft. centers. Since the building was "windowless," units were installed around the outside of the room close to the wall to illuminate benches. Maintained illumination intensity resulting from this arrangement averages 50 ft.-candles. Range of intensities from lowest to highest is 45 to 55 ft.-candles.

•

Immersion Units "Up" Fuel Oil Temperature

Three 5-kw. electric immersion heaters in a shop-fabricated after-heater have solved the problem of heating fuel to the correct temperature for proper combustion at the Dole Valve Company plant, in Chicago, during winter months when entering oil temperature is lower than normal.

Fuel oil for plant furnaces until recently was heated entirely with steam in a preheater designed to raise the temperature of 100 gal. of oil per hour from 65 to 190 deg. During winter months oil from the 2,000-gal. storage tank frequently enters the steam preheater at around 35 deg. and leaves it considerably



THREE 5-kw. immersion heaters in shop-fabricated after-heater boost fuel oil temperature leaving steam preheater

under the desired firing temperature.

To correct this condition three 5-kw. G.E. Calrod immersion heaters were installed in an after-heater made from a 48-in. length of 10-in. pipe closed at both ends with pipe caps, one of which was tapped to take the three heating elements. With oil from the steam preheater passing through the after-heater the thermostatically controlled immersion units "cut in" when oil temperature drops below 185 deg.

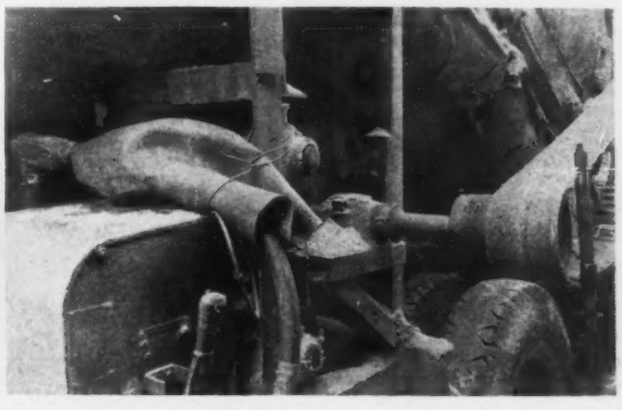
The electric after-heater is designed to handle 300 gal. of oil per hour, so that in the event of loss of steam it can supply enough hot oil to keep essential foundry furnaces operating. A non-circulating type oil immersion heater was selected for the unit to prevent damage to the heating elements in case the oil pumps failed while the heater was in operation. The immersion units are delta-connected and supplied from the 230-volt, three-phase plant distribution system. While normal oil demand is 100 gal. per hour, 300 gal. of oil is pumped through the after-heater, of which 200 gal. is recirculated.

•

Electric Drive Improves Saw Rig

Experiencing continued difficulty with its gasoline-motor-driven saw rig, the City Fuel Company, Seattle, Wash., switched to electric power by exercising considerable imagination and ingenuity. As shown in the accompanying illustrations, an old truck frame and cab, including the truck motor, was used to construct the new rig. One 40-hp., 440-volt, three-phase induction motor drives the conveyors, chains and saws by belts. The motor is mounted directly behind the cab on the frame of the truck and underneath the conveyor platform. The motor cost $300, one 200-ft., three-conductor No. 6 cable $120, and the total cost $675, including $255 for installation.

Operating data on a monthly basis for the rig is 600 cords of firewood, 1,800 kw.-hr. power requirement, 120 man-hours (one man handles the equipment on a six-hour shift). Since building the first machine, City Fuel has constructed two more and had another built by contract for its Everett, Wash., yard. All of these rigs are portable and J. R. Tucker, superintendent of the fuel company, says: "These machines are much faster and save about $1 per cord over the old method." Advantages of the electric-powered rig are that it is fireproof, cuts to exact lengths desired and reduces labor and maintenance costs.



LOADING CONVEYOR with cordwood headed for saws, after which it will automatically dump into truck (left). Motor and starting switch mounted on truck frame and connected by belts to saws and conveyors for driving (right)

LOAD BUILDING

Combination Lighting at Pittsburgh Gallery

Masterpieces of famous artists in the Carnegie Institute Gallery "A" in Pittsburgh are now able to be seen indoors just as the artists painted them, and many people for the first time are seeing parts of famous paintings which heretofore were not discernible. This is the result of a new system of lighting specially designed for Carnegie Institute by Richard C. Engelkon, lighting consultant, and manufactured by Westinghouse.

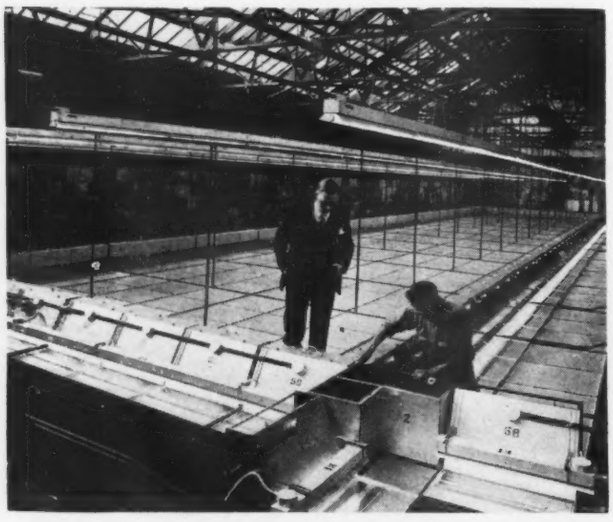
Because olden-time artists painted under natural sunlight, which differs from ordinary incandescent electric lighting, paintings viewed under artificial lights were never seen in their true colors, and detail in dark spaces in the paintings were not discernible to the spectator. By means of a special combination of 220 incandescent and 206 fluorescent lamps and fixtures the 112-ft. long gallery is lighted with an illumination nearly identical to sunlight, and to the natural daylight by which most painters produced their works.

These illumination effects have been produced without making the visitor conscious of the lighting. For example, lighting on the paintings is approximately eight times as bright as in the center of the gallery. This creates light comparable to the most ideal condition for viewing a scene out of doors. This illumination is obtained from a completely luminous ceiling of heat-treated water-white glass, above which are mounted four continuous rows of fluorescent lighting units. The light from these lamps is mixed with that from the incandescent units, mounted above control lenses which form part of the glass ceiling, along the four walls of the gallery.

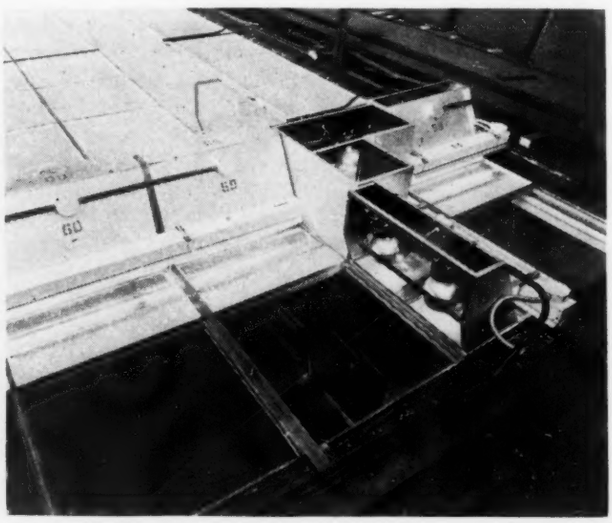
In order to obtain correct color matching the control lenses are treated to take advantage of the relatively small amount of blue and green emitted by the incandescent lamps.

Paintings Toned

Results of the new lighting are very pleasing. Each painting now shares equal prominence around the gallery. By adjusting lamp angles and lenses, dark paintings have been toned up and the brilliant ones toned down. Under this light many paintings were seen for the first time as the artists had painted them. For example, the figure in Whistler's portrait "Sarasate" can now be seen wearing shoes. Under the old lighting his legs and feet were invisible in the blackness of the background.

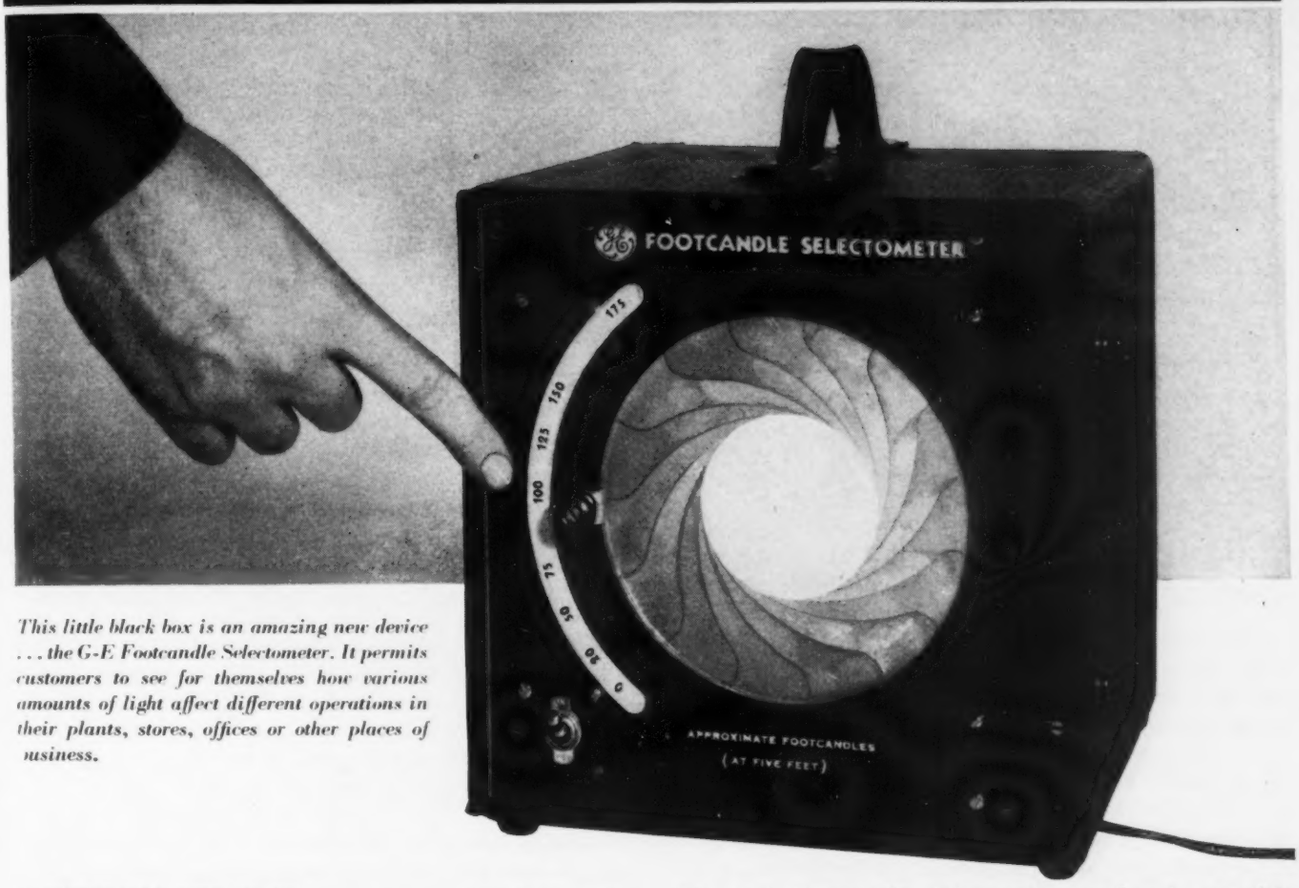


ABOVE THE ART GALLERY—Workman and lighting consultant are working above completely luminous ceiling at Pittsburgh art gallery. Arranged in four continuous rows are 206 blue-green fluorescents matched with 220 incandescent spots



SPOTLIGHT DETAIL—Incandescent spot lights are located above the gallery and along the four walls. Control lenses are treated for color matching. Spectator viewing a painting is seen through the opening in the ceiling

How to show a customer a sample of 100 footcandles!



This little black box is an amazing new device . . . the G-E Footcandle Selectometer. It permits customers to see for themselves how various amounts of light affect different operations in their plants, stores, offices or other places of business.

IF YOU'VE EVER TRIED TO SELL a customer a 100-footcandle lighting installation, you know what a lot of resistance you've had to overcome before you got to first base.

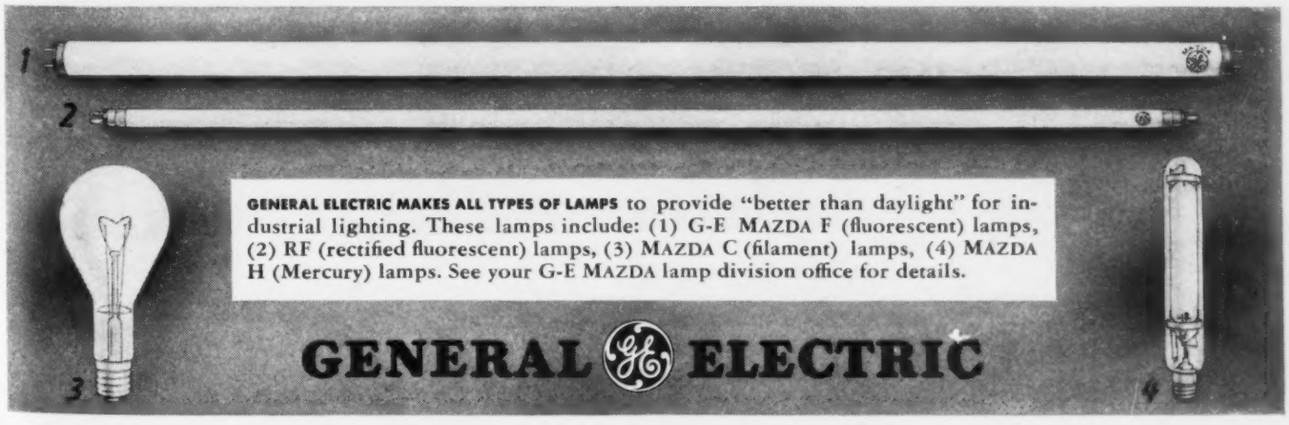
Why? Largely because 100-footcandles is something that's difficult for most people to visualize. If they could see 100 footcandles . . . actually experience how much easier, faster, and more efficiently they could work under 100 footcandles, higher level lighting would be easier to sell.

AND NOW THE G-E FOOTCANDLE SELECTOMETER provides the answer to the lighting salesman's prayer. It offers a means to show customers what 100 footcandles look like. Yet the Selectometer is just as portable and even lighter than most sample cases.

The G-E Footcandle Selectometer makes it possible for your customer to select the amount of light he would like for easier seeing. It works on a simple principle whereby the amount of light directed on a job can be increased or decreased . . . anywhere from 0 to 175 footcandles. After a little experimenting, the customer can tell when the light seems best to him.

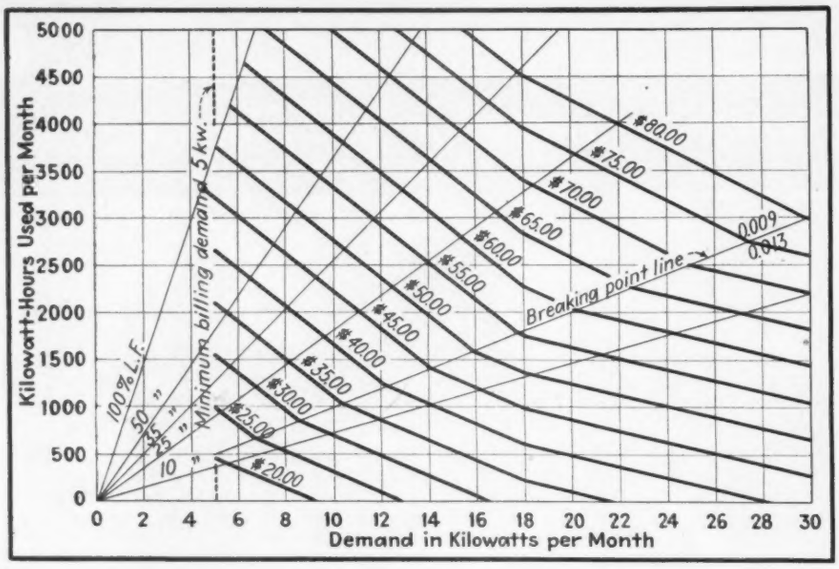
FROM THEN ON, the experience of scores of lighting salesmen shows that the job of selling the higher level lighting installations is much simpler. Every lighting salesman in your territory should carry one. How many can you use?

For complete information, see your local General Electric Lamp Division Office.



GENERAL ELECTRIC MAKES ALL TYPES OF LAMPS to provide "better than daylight" for industrial lighting. These lamps include: (1) G-E MAZDA F (fluorescent) lamps, (2) RF (rectified fluorescent) lamps, (3) MAZDA C (filament) lamps, (4) MAZDA H (Mercury) lamps. See your G-E MAZDA lamp division office for details.

GENERAL ELECTRIC



IDAHO POWER provides bill line charts for dealers who wish to advise customers as to billing costs when new appliances are added. Present demand and present usage intersect at point of present bill. New demand and new usage intersect at point of future bill

Bill Chart Aids in Dealer Estimating

Electric power rates and rate structures being what they are from the standpoint of understandability, there is hardly an industrial manager who is not frequently approached by some of his dealers somewhat in this manner: "I wish you fellows would figure out some way so that I can tell my prospect how much additional it is going to cost him for current to operate the device I am trying to sell him. Oh, I know you'll say for me to just come to you or the rate department and it will all be figured out. But if I have to do that, by the time the information gets back to me, the prospect has perhaps grown cold and the sale is lost."

Orland C. Mayer, commercial-industrial sales manager of Idaho Power Company, Boise, has met this problem by drawing up a series of charts that the dealer can use to answer such questions and strike while the iron is hot. The one here reproduced is the one for the lowest range—up to 30 kw. demand per month. Others have been worked out up to 90, 165 and 300 kw.

The way it works is this: When the prospect asks how much extra the new current-consuming device will cost him per month, the dealer asks to see the prospect's last month's electric bill. As shown by the bill, he locates the points of "Demand in Kilowatts per Month" and "Kilowatt-Hours Used per Month" on the horizontal and vertical, respectively. Where the lines from these two points intersect is the point of the amount of the last month's bill, located at or near one of the "dollar amount" lines drawn on the chart in $5 gradients.

The next step is to estimate what the kilowatt increase in demand will be with the new device connected and locate that point on the horizontal by adding to the present demand. Then the customer and the dealer estimate between them the probable number of kilowatt-hours the device will consume per month and locate that point on the vertical in excess of the present consumption. Where the lines from these two new points intersect will be found the new total of the bill. The difference between the two amounts will represent the actual cost per month of operating the device.

Not only have these charts been of great help to dealers but, as Mr. Mayer pointed out, large customers are using them to analyze their load problem, with a view to effecting possible economies. This is not objectionable to the company, which, of course, is anxious to have its service used to the best advantage of the customer. Sometimes these studies result in gains to the company and he cited one interesting case of a customer using a Diesel engine part time as a power auxiliary to the electrical service, in order to save on power, as he thought. When it was suggested that an electric motor might be added to displace the Diesel, and the actual extra power cost to operate the motor was computed by means of the chart, it was found that the Diesel had actually been costing him money instead of saving it, as contrasted with 100 percent electrical service.

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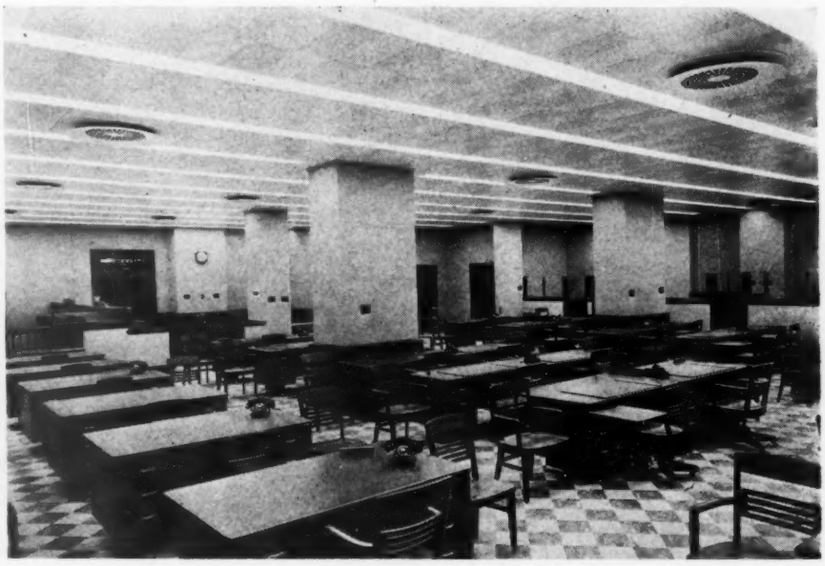
Forty-nine Ft.-Candles for Chicago Office



An average of 49 ft.-candles on the working planes is provided by continuous Permaflector troffers with Flutex glass panels and 1.6 watts per sq.ft. of white fluorescent. To add a pleasing warmth, walls and Venetian blinds are painted a reddish brown and flooring is a light warm tan.

Detroit, Refractors and Your Own Residential Streets

A True Story

AN extraordinary thing has happened in Detroit, Michigan . . . Today its name stands high among those cities that have made the greatest advances in street lighting technique. Yet it was not so long ago that Detroit introduced the use of "death curves" to measure mortality in terms of street lighting effectiveness.

Because of its geographic location and unparalleled industrial conditions, Detroit has an acute traffic and street safety problem. A map would show, roughly, three important arcs about the hub of the city. The inner circle represents the sky-scraper business section. The second arc indicates the residential districts. In the outer arc are located hundreds of defense factories.

Thousands upon thousands of defense workers, traveling to and from these plants swell a constant flow of "through" traffic on the heavily burdened thoroughfares that radiate through the residential areas. The problem of lighting Detroit streets to make them safe as well as to keep traffic moving was a difficult one – made more critical by the fact that the solution had to come within the limits of reasonable operating economy.

A solution to this residential street lighting problem was found by Mr. Louis J. Schrenk, Superintendent, and the engineers of Detroit's Public Lighting Commission. They employed the flexibility and all-round adaptability of the Holophane Refractor to develop a new "2-WAY" luminaire which offers these advantages:

(1) *Permits luminaire spacings of 300 feet.*

(2) *Provides a bright pavement surface for clear silhouette vision even at this wide spacing.*

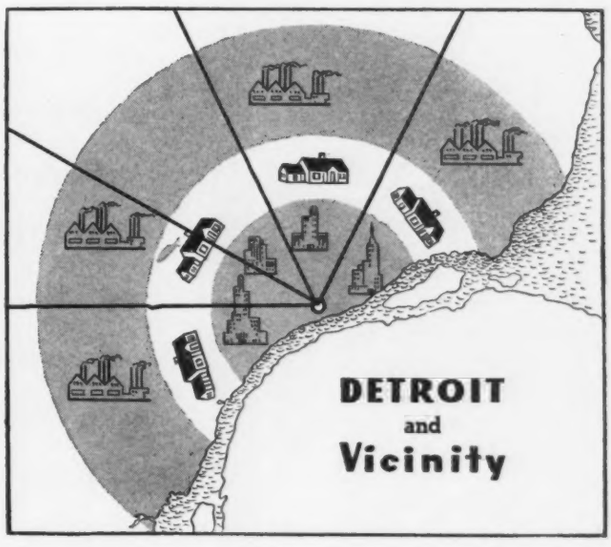
(3) *Emits light at approximately equal intensities from the entire surface of the refractor in directions along the street which counteracts surface brightness and improves appearance.*

(4) *Provides remarkable shielding for houses on both sides of the street.*

(5) *A modification of this luminaire when placed at intersections delivers twice as much light flux along the "residential traffic flow streets" as along the quieter cross "feeder" streets.*

(6) *Produces more useful, effective light distribution for visibility at lower annual cost in economical operation and servicing.*

This latest Holophane contribution to street lighting progress takes on added meaning when you investigate how the same results can be obtained for your own locality. Space here permits us only to touch on the facts, but if you will write we will send you more details of the Detroit Story. It makes exciting reading and will help you to save lives and dollars in your own city. *Address Street Lighting Department, Holophane Company, Inc., Newark, Ohio.*



HOLOPHANE COMPANY, INC., 342 Madison Avenue, New York City

NO. 8

ALUMINUM, DEFENSE, AND YOU

OCTOBER WAS A MILESTONE MONTH

There have been three other such milestones for civilian uses of aluminum during the past 18 months.

WHEN, ON MARCH 25, 1940, the price of Alcoa Aluminum ingot was reduced from 20c to 19c a pound, it automatically increased the number of civilian applications where using aluminum would be good cost arithmetic.

19¢

Every application carries its own special set of conditions. They determine how much you can pay to save a pound of weight, to get extra heat conductivity, or reflectivity, or what not. 19-cent ingot widened the circle of aluminum's usefulness.

AUGUST 1, 1940 WAS THE SECOND milestone. Economies growing out of greater volume of manufacture, and economies stemming from continuing research, brought the announcement of 18-cent ingot. The civilian manufacturer looking to his future could see, in the offing, more ways to use aluminum than ever before.

18¢

Perhaps you were one of the thousands who filed away in your book of futures the reminder that

"when this thing is over, we must figure on using more Alcoa Aluminum."

THIRD MILESTONE showed up almost before you got that note made. November 18, 1940 saw another reduction on Alcoa Aluminum ingot to 17c a pound, making a total reduction of 15% in the midst of a general seller's market. Defense got most of the immediate benefit, but the future of aluminum for you, and you, and you, was writ larger than ever.

17¢

THEN CAME 15c INGOT, effective Oct. 1, 1941, with accordant reductions in fabricated forms of Alcoa Aluminum. This means that the arithmetic of weight saving is all new, since last you figured on using this versatile metal in a civilian application. When the emergency is over, the fact is that all your old material cost comparisons will be as dead as a dodo.

15¢

THE ARITHMETIC IS NEW; but the fundamentals just get more so! More than ever, the strong alloys of Alcoa Aluminum are *the* answer to lightness with strength.

ALCOA ★

ALUMINUM COMPANY OF AMERICA

NEW ENGINEERING IDEAS

3-Ph. Motor Starting on 4-Wire Systems

By BRUCE SHIPLEY
Knoxville, Tenn.

A method is presented for approximating the voltage regulation or flicker caused on a primary distribution line when the so-called open-wye open-delta transformer connection is used. The procedure follows the principle of regulating the phase on which the voltage is the lowest during the motor-starting period and takes into consideration two variables—the distance (D) in thousands of feet, and the motor horsepower ($hp.$). Certain assumptions have been made in the preparation of a chart (see caption). An example is included for the use of the chart.

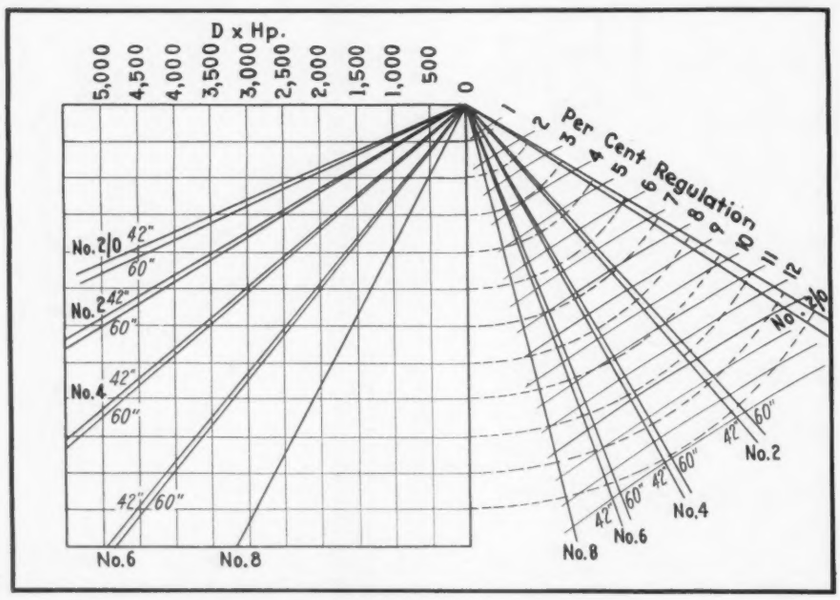


CHART for 7.9-kv. primary regulation for open Y-△ motor starting

Wire spacings used are 42 in. and 60 in. Copper sizes used are Nos. 8, 6, 4, 2 and 2/0. The regulation at other voltages may be approximated by using the square of the voltage ratio. Phase-to-ground voltages should be used when converting the regulation to other voltages.

Assumptions—Motor draws 600 percent load; current at 20 percent power factor; neutral Z equals 60 percent phase Z.

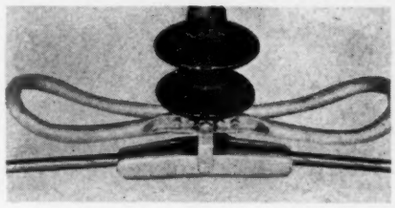
Example—120,000 ft. No. 8 copper; 10-hp. motor, 7.9-kv. primary regulation equals 5.6 percent; $D \times hp. = 120 \times 10 = 1{,}200$.

Note—For 4 kv., use $10 \times D \times hp.$

•

New Hardware on Boulder Lines—II

The question of vibration of type HH cable (ELECTRICAL WORLD, November 1, 1941), which was new in 1933, was studied thoroughly in the laboratory, in the field and at Stanford University, and these tests showed that the cable had inherent non-vibratory characteristics. Later tests showed that there were a few critical spots where there was a tendency toward vibration; at no place on the line, however, was there sufficient vibration to indicate, according to the life curve, that injury could be produced within 50 years. During the final study, however, it was observed that even at the places where the vibration was at its maximum a slight force tending to oppose any untwisting of the cable seemed to destroy the vibration immediately. This observation resulted in the development of the Goss damper.



VIBRATION DAMPER is a weight made up of two castings bolted together on the cable in a horizontal plane. It tends to oppose any untwisting of the cable and thus to destroy any vibration that may be set up

The Goss damper is a 13-lb. spherical weight bolted on the cable. It consists merely of two castings, each of which is a half sphere, with half the clamp projecting from it. The two parts are bolted together by one stove bolt, causing the clamp to grip the cable. Interiors of the clamp parts are machined. Investigations, including energy input tests, show the high efficiency of the damper, and other tests proved there was no tendency for the damper to sag down or to wear the cable—these tests, incidentally, were carried up to 300,000,-

Use Combination Starters

(Across-the-Line Starting Switch + Disconnect Unit)

for Economy, Convenience, and Safety

Available in 5 Popular Sizes—Enclosures for Every Type of Service

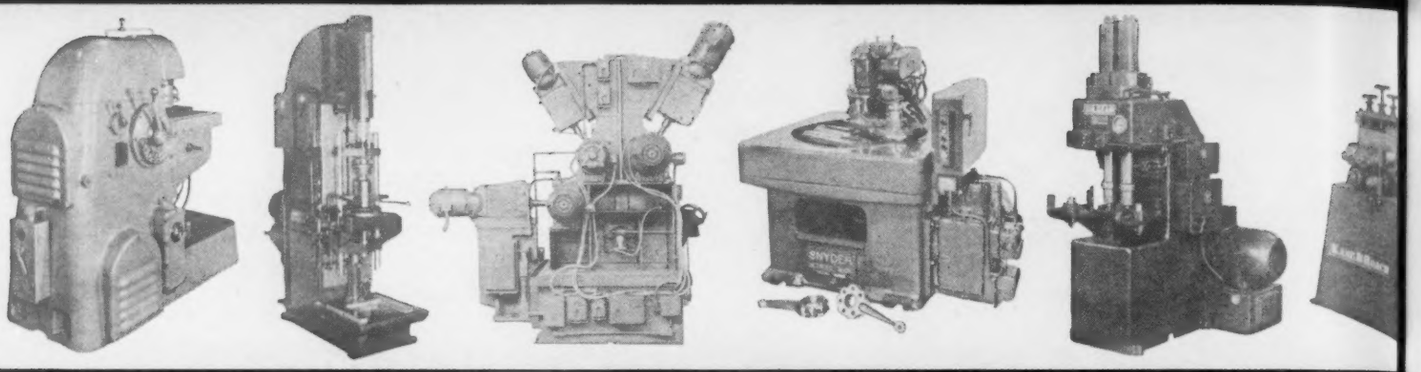
ALLEN-BRADLEY

BULLETIN 712-713 COMBINATION STARTERS

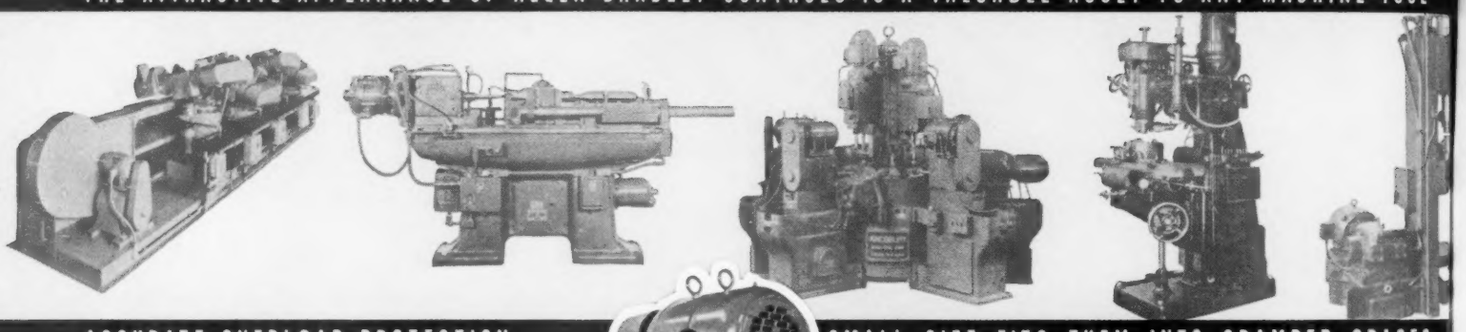
QUALITY

The Machine Tool Industry

has gone over in a big way to Allen-Bradley Controls

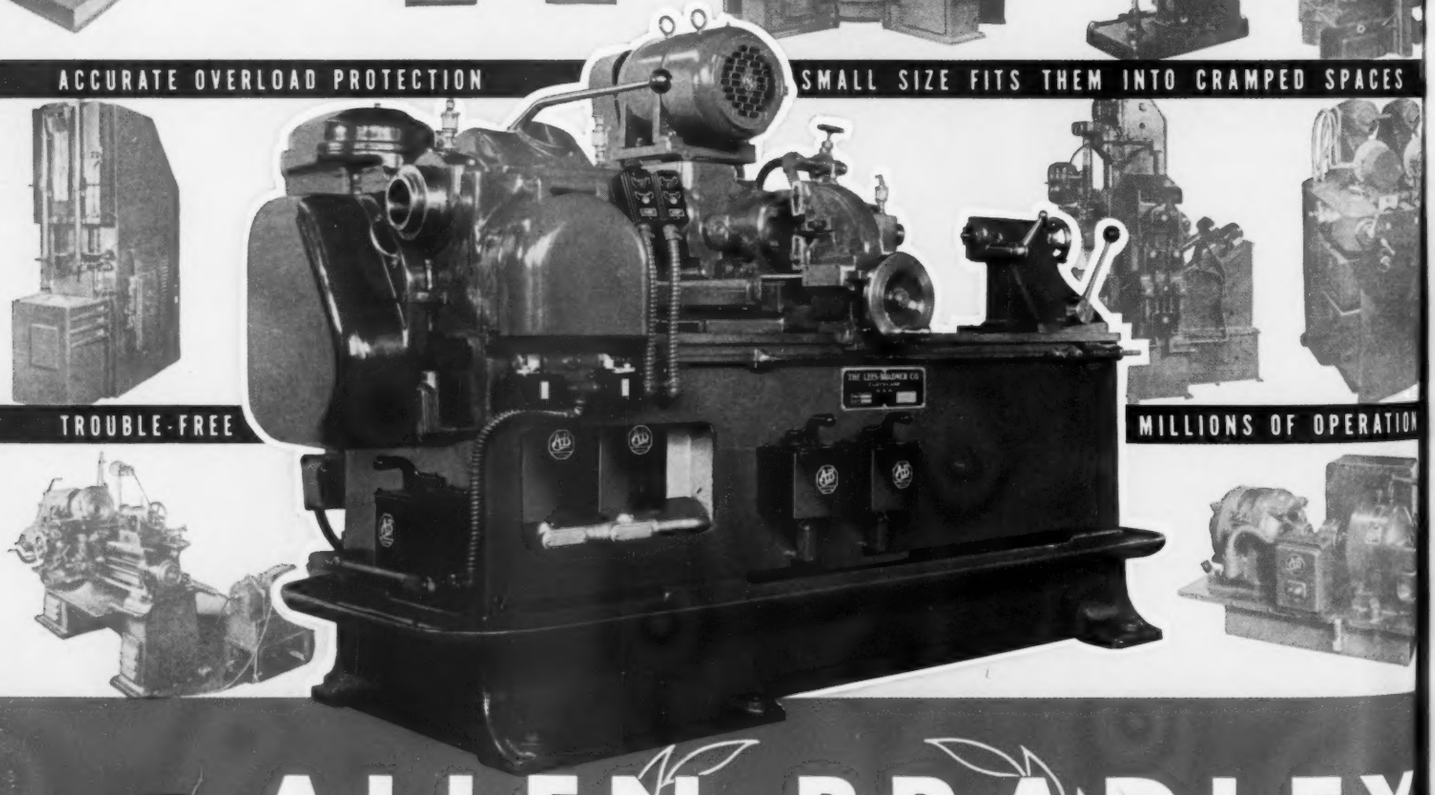


THE ATTRACTIVE APPEARANCE OF ALLEN-BRADLEY CONTROLS IS A VALUABLE ASSET TO ANY MACHINE TOOL



ACCURATE OVERLOAD PROTECTION

SMALL SIZE FITS THEM INTO CRAMPED SPACES



TROUBLE-FREE

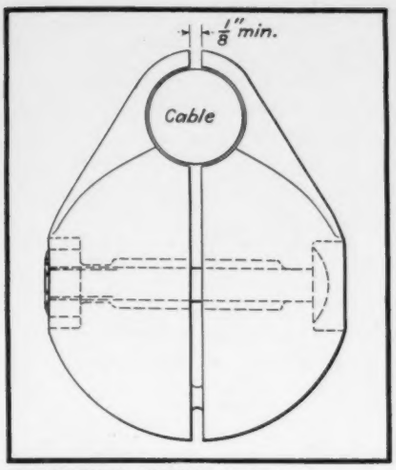
MILLIONS OF OPERATION

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

Allen-Bradley Company, 1327 S. First St., Milwaukee, Wis.

QUALITY



SUSPENSION CLAMP features a "free center"

Small double-wedge clamp bolted to the cable in the center of the suspension clamp but not touching the clamp. Normally, cable is supported only on two small saddles near the ends of the clamp; in case of a break, the free-center wedges will hit the housing and hold the cable

000 cycles of forced vibration. Only about 15 percent of the total length of the line was equipped with dampers, namely, those points where observation indicated a greater tendency to vibrate than on the rest of the line.

Fundamental principle of the "free-center" suspension clamp used on the cable is to distribute and reduce any stresses that may be induced in the conductor by vibration, particularly the out-of-phase type, where the cables on opposite sides of the clamp move simultaneously up or down. In the conventional suspension clamp the cable is supported on a seat and the bending caused by a given amount of motion is concentrated near the points of tangency.

In the "free-center" clamp practically the entire arc of cable in the clamp is free to move, since it is supported only on two small saddles near the ends of the clamp. Under normal conditions there is no need for an actual gripping of the cable at suspension points, since any forces tending to move the cable longitudinally of the line are accommodated by a slight swing of the insulator string without slipping on the saddles.

In case of a break, however, it is advisable to grip the cable. This is accomplished in the "free-center" type by a small double-wedge clamp bolted to the cable in the center of the clamp, but not touching it. In the event of a conductor break it will hit the housing and hold the cable.

The fittings were manufactured by Thomas & Betts Company, except for the Goss damper, which was furnished by General Cable Corp.

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Factors Influencing Cable Emissivity

By W. B. ELMER
Boston Edison Company

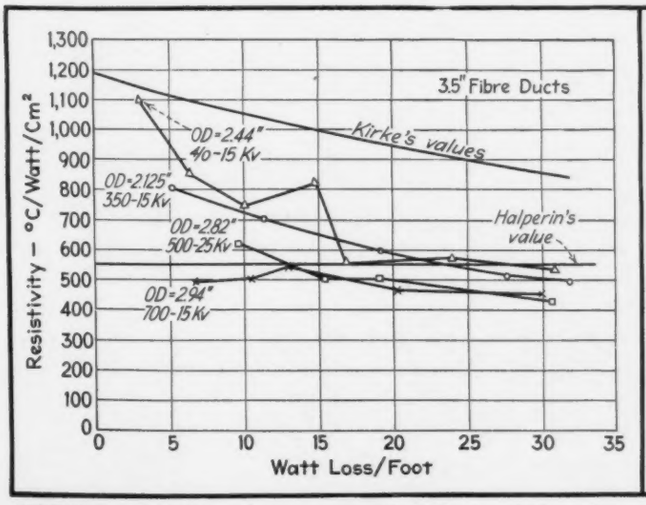
Recent studies of cable temperatures as affected by sheath emissivity point to the desirability of further investigation of operating conditions in the interest of more economical use of the investment in underground conductors. In the method of computing copper temperatures from measurements in occupied ducts more precise knowledge of sheath-to-air resistivities is required. Calculations such as given in the 1930 A.I.E.E. paper by Kirke give satisfactory results when the entire temperature drop from cable sheath to duct wall is computed as a unit, but the Kirke values for sheath-to-air resistivities appear too high for sheaths in good condition. This is confirmed by Halperin's recent work. However, Halperin's test data were determined on values below 9 watts per foot, whereas losses of 30 watts per foot are not unusual for some cables.

Results of Tests

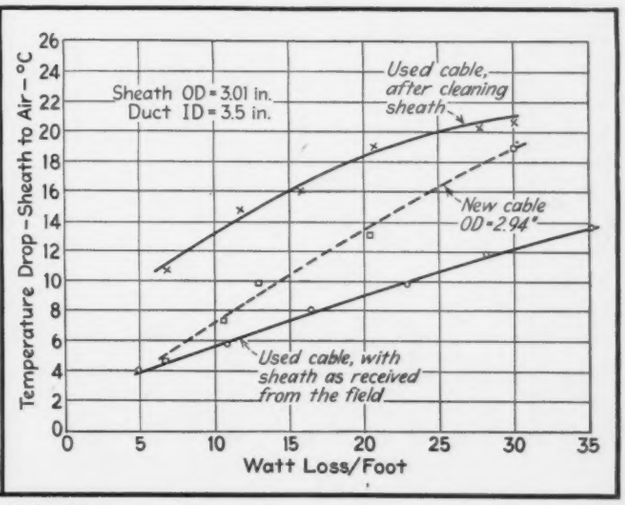
In our own (Boston Edison) tests four standard 3½-in. fiber ducts were installed in damp sand. Cables with four different diameters were placed in the ducts, with sheath and air thermocouples and maximum reading thermometers. End heaters and heat insulation were used to eliminate gradients along the samples. Other suitable precautions were taken.

These results indicate (1) a definite decrease in sheath resistivity with increase in watts loss, and (2) a decrease in resistivity for larger cable in a given size duct.

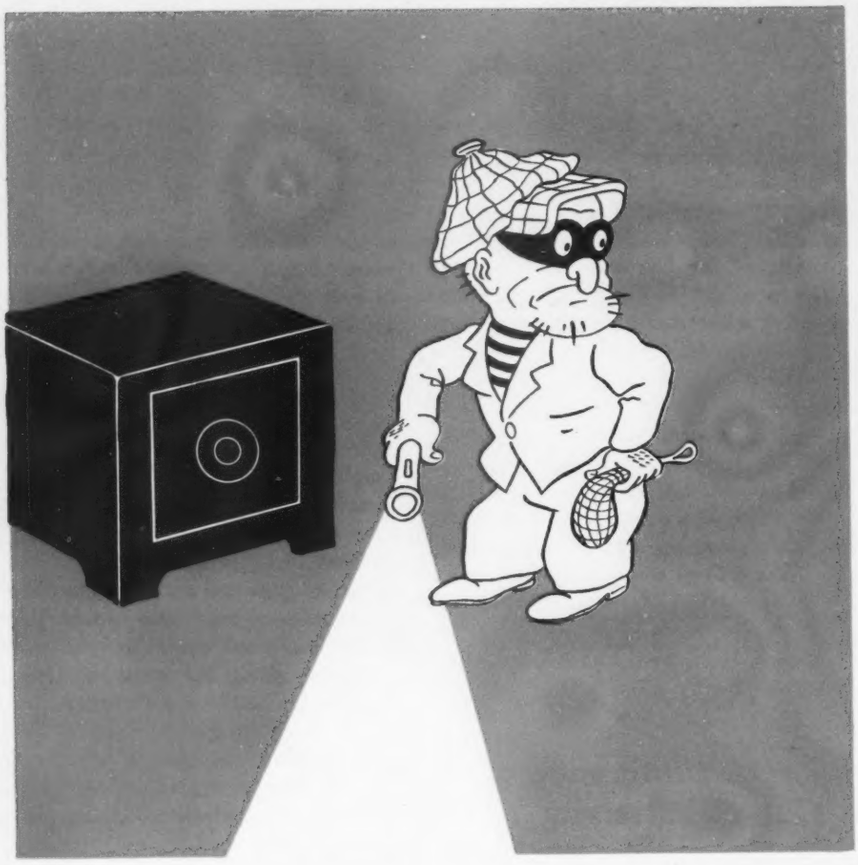
In a later test designed to show the effect of field dirt and grease on sheath emissivity a 10-ft. sample of cable, just as received from the field, was also installed in a 3½-in. fiber duct placed in damp sand. Sheath and air temperatures were measured by thermocouples; maximum reading probe thermometers were also inserted, and the previous precautions taken against thermal gradients along the conductor of the test specimen. On completion of the first run the cable was removed from the duct



THERMAL resistivity values of unused cable in 3½-in. fiber ducts as related to watts loss



SHEATH thermal drop against watts loss in cable removed from service



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Working with you on your particular problems is one of the most important functions of Southern States' engineering department. You have only to write, wire or telephone your problem, whatever it may be. If an expert is needed, he will be sent to work with you right on the job.

So when you strike a snag, call on Southern States. When the sailing is smooth, remember us. Remember, too, that Southern States can supply you with electrical equipment ranging from one fuse link to a complete substation.

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and the dirt and grease scraped off, followed by wire scrubbing. The cable was then reinstalled in the duct and again heated. The test results are shown in the accompanying illustration, and for additional comparison the results of a test on a new cable have also been charted.

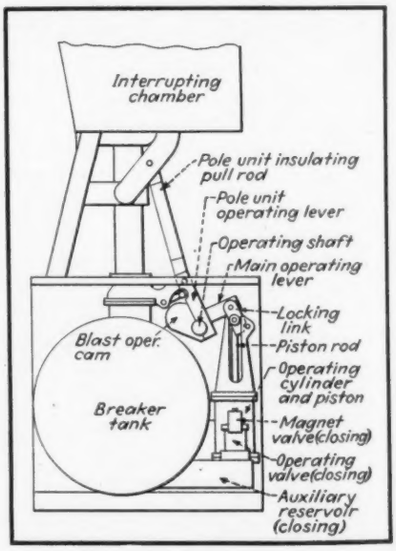
The dirt and oxidation on the sheath apparently caused a large increase in sheath emissivity. Since only one sample has been tested at this writing, it is too early to form quantitative conclusions as to the effect, but the comparison is interesting.

•

Pneumatic Mechanism for Circuit Breaker

By F. BICE JOHNSON
Switchgear Engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Compressed air, from a breaker tank to either end of a cylinder, is utilized to move a piston and transmit motion through a linkage to open and close contacts of a circuit breaker. Small magnet valves energize air-operated valves to give the required



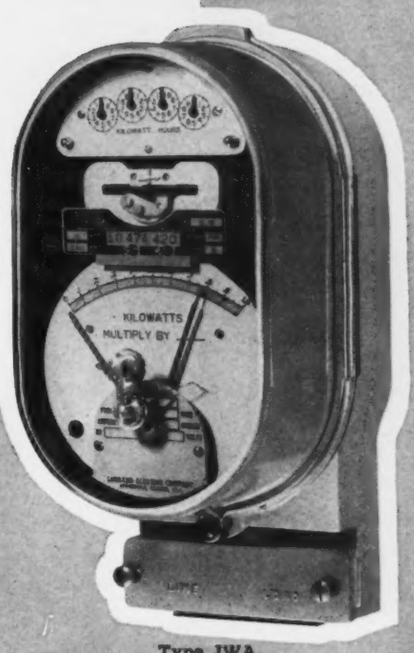
PNEUMATIC operating mechanism for a compressed air circuit breaker

contact speed. The pneumatic operating mechanism, shown diagrammatically in the illustration, is applied to Westinghouse compressed air circuit breakers and eliminates the necessity of a heavy opening spring, which is a part of the usual solenoid operating mechanism. The breaker contacts are

Simplified DEMAND METERING

SANGAMO TYPE JW COMBINATION WATT-HOUR-DEMAND METERS ARE ECONOMICAL IN FIRST COST, CONVENIENT TO INSTALL, AND REQUIRE PRACTICALLY NO MAINTENANCE

The demand metering of commercial loads is accomplished conveniently and economically with Sangamo Type JW combination Watthour and Demand Meters. This is especially true where existing watthour meter installations make no provisions for separate demand meters, or where mounting space is limited. Type JW meters combine two standard meter elements, the Sangamo Type J Watthour Meter and the Lincoln Type WD Watt Demand Meter, in a single unit, with a single set of terminals. Supplied in singlephase construction, for bottom connected or socket mountings, Type JW combination meters are suitable for either indoor or outdoor service.



Type JWA,
Bottom Connected Mounting

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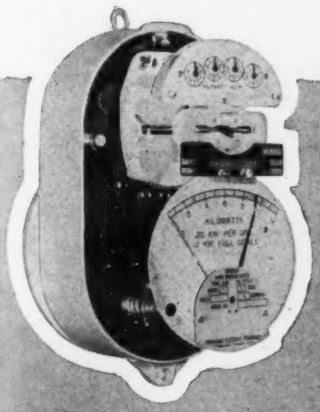
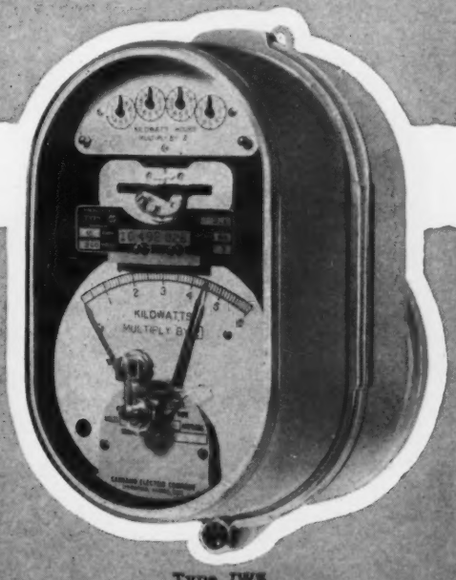
Sustained accuracy and exceptionally low maintenance of Lincoln Demand Meters is backed by 12 years of leadership in the design and manufacture of these meters, as well as by the fact that over 140,000 units in the field have been tried and proven successful.



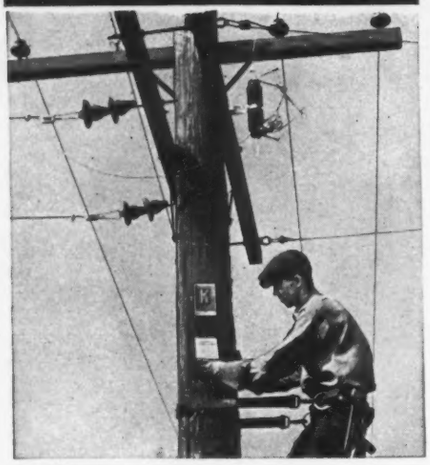
Type JWS, Cover Removed

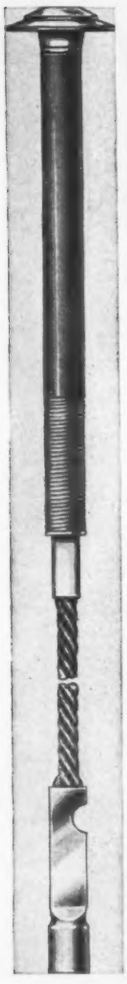


Type JWS,
Socket Mounting

LINCOLN METER DIVISION
SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

SAFEGUARD
THESE IMPORTANT
FUSE SWITCHES





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locked in the closed position by toggle action.

Compressed air during a circuit interruption is supplied to the arc chute of each pole of the breaker through its own blast valves, located in the breaker tank and operated mechanically by a cam on the operating shaft. This insures accurate synchronization of the blast of air through the interrupting chamber with motion of the contacts. The cam does not engage the blast valve mechanism during the closing stroke.

Compressed air for opening or closing of the breaker is supplied from the breaker tank, at full tank pressure initially, to an auxiliary tank of limited size and then to the cylinder. High acceleration of the contacts is obtained. The force acting on the piston at the end of the stroke is very greatly reduced, thus preventing excessive shock, slam and rebound.

In order that the breaker be essentially trip-free, a dump valve opens automatically when instantaneous tripping is required, allowing high-pressure air in the closing cylinder to escape. This same valve also operates after tripping and before closing to remove the residual high pressure from the opening side of the cylinder.

A low-pressure alarm device and a pressure-actuated device which locks out electrical control at a predetermined minimum pressure are two safeguards provided against operation of the breaker with insufficient pressure in the breaker tank.

•

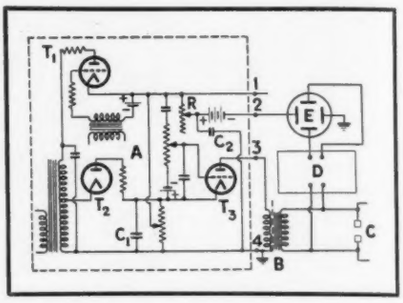
Analyzer Determines Recovery Phenomena

By G. W. DUNLAP
General Engineering Laboratory,
General Electric Company, Schenectady, N. Y.

An equipment known as a "recovery voltage analyzer" has been developed to determine the recovery characteristics which circuits present to interrupting devices without the necessity for full-power interruption tests. It involves the use of a low-voltage repeating type surge generator with a synchronized sweep circuit whereby high-speed transients may be made to appear on a cathode-ray tube as stationary waves. This equipment is portable, can be used in the laboratory or field, is operated on 110–120 volt, 60-cycle power and consumes only a few hundred watts.

The various components of this equipment, which for convenience are built as separate units, are:

1. A multiple surge generator generates a succession of surges, the shape of which will depend on the elements connected to the terminal marked "surge." The surges with synchronized beam-control and sweep



CONNECTIONS of recovery voltage analyzer

A — Multiple surge generator with (1) trip impulse terminal, (2) sweep impulse terminal, (3) surge terminal, and (4) ground terminal. B — Multiple surge transformer. C—Test circuit. D—Multiple surge amplifier. E—Cathode-ray oscillograph.

are produced 60 times per second. On the screen of the cathode-ray tube there is produced a stationary image of sufficient steadiness and brightness for viewing or photographing over the full range of sweep speeds giving sweep time of from 5 to 1,000 microseconds.

2. The surge transformer gives a range of inductances from 60 millihenries to 4.5 henries to shape the wave as desired.

3. The amplifier makes it possible to keep the size and required power of the outfit within reasonable limits.

4. The cathode-ray oscillograph has a medium-persistence screen and the 5-in. tube is operated at 3,000 volts.

5. The camera gives a record approximately one-fourth the size of the actual image of the tube screen. With high-speed film, records may be obtained by exposures of 1/50 to 1/5 second, depending on sweep speed and beam intensity.

The several devices are connected as shown in the illustration. The circuit to be measured must be deenergized. Effect of any change made in the circuit is immediately apparent in the transient recovery voltage wave on the tube screen.

Range of conditions under which satisfactory performance may be expected includes natural frequencies from 1,000 to 250,000 cycles per second and load impedances up to 20 ohms.

Values measured from the analyzer oscillograms show close agreement with those obtained from high-speed cathode-ray oscillograms taken during actual interruption tests.

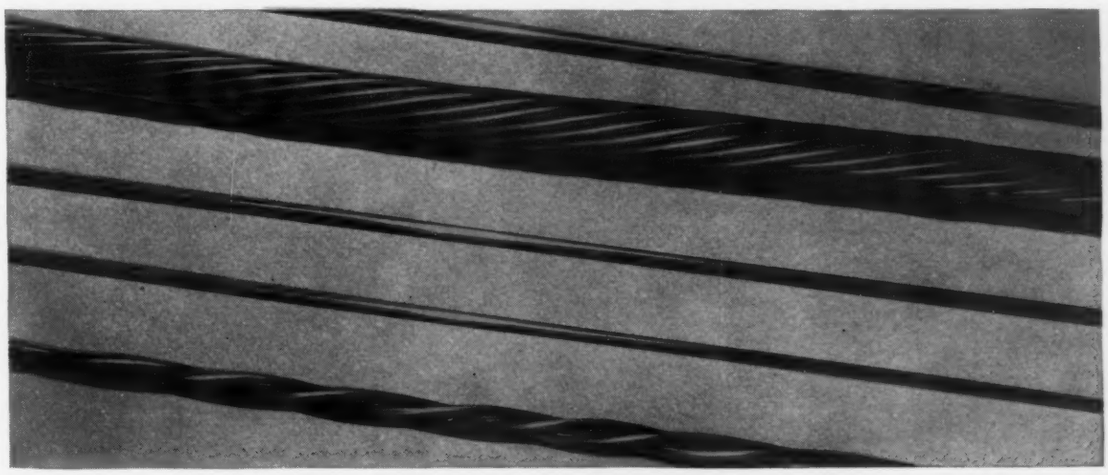
USE COPPER WISELY -do not waste

COPPER . . . vital in a thousand ways to defense . . . must be used wisely. For example, using OVERSIZE copper conductors to obtain MECHANICAL strength is wasteful of precious material. The steel core of the Copperweld wire provides mechanical strength in Copperweld or Copperweld-copper Conductors. The copper need only do the job that copper does best—conduct electricity.

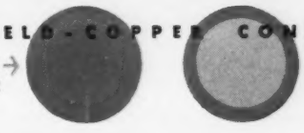
Typical applications of copper-saving Copperweld are: power conductors for electric transmission and distribution systems, telephone line wire, telephone drop wire, telephone interior wiring, railroad signal line wire, railroad telephone line wire, and telegraph line wire.

Copperweld wire may also be used for many mechanical and non-electrical applications where brass or bronze wires have been employed.

COPPERWELD STEEL COMPANY, GLASSPORT, PENNA.



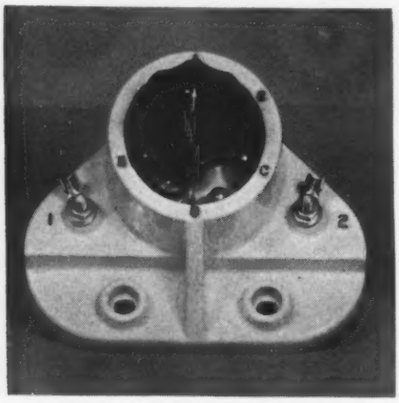
COPPERWELD AND COPPERWELD-COPPER CONDUCTORS CONSERVE COPPER



NEW EQUIPMENT

Tap Changer

Rotary tap changer which will be available on distribution transformers has live parts recessed into white porcelain body



Rotary tap changer. **Pennsylvania Transformer Co.**, 808 Ridge Ave., N. S., Pittsburgh, Pa.

so as to obtain greater creepage distance between adjacent leads. Studs on each side serve to make the connection between the high-voltage leads from the coil and the live leads coming through the bushings.

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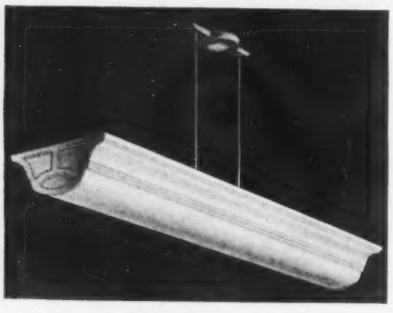
Fluorescent Luminaire

Indirect illumination is provided by a new luminaire development utilizing fluorescent lamps. Light distribution of the unit permits wider spacings and makes fixture suitable for low ceiling installation,



"Indirect Flu-O-Flector;" various sizes accommodate two 40-, 65- or 100-watt fluorescent lamps. **Edwin F. Guth Co.**, 2615 Washington Blvd., St. Louis, Mo.

it is claimed. Fixtures can be mounted individually or in continuous rows. Accessories are joined to underside of reflector.

•

Floodlight Bulb

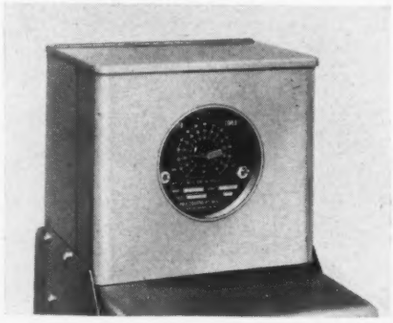
Floodlighting concentrator; seven sizes up to and including 1,500 watt. **Birdseye Division, Wabash Appliance Corp.**, 335 Carroll St., Brooklyn, N. Y.

New type of concentrating floodlight bulb is designed to "force down" to the work plane level the full light that the filament develops. It is suitable for high bay lighting. Filament is mounted at the exact focal point of the hump-shaped parabola of the bulb, so that light rays are forced straight out of the bulb without waste, it is claimed. Inside of the bulb is lined with polished silver.

•

Welder Timer

New type of precision timer is provided to control automatically the welding time



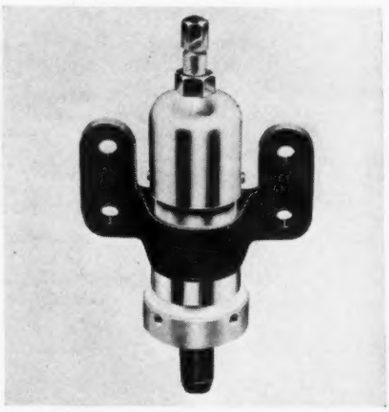
Automatic timer for spot welder; adjustment range from 3 to 47 cycles, calibrated in one-cycle steps. **Pier Equipment Mfg. Co.**, Benton Harbor, Mich.

period for the company's Ace spot welder. Timer is of the electronic or tube type and has three concentric scales on a direct-reading dial. Maximum timing variation is said to be controlled to a plus or minus 1/120th second on short time welding.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Switch

A "manhole tamper switch" has been developed for establishing or breaking an electrical circuit in the event of tampering



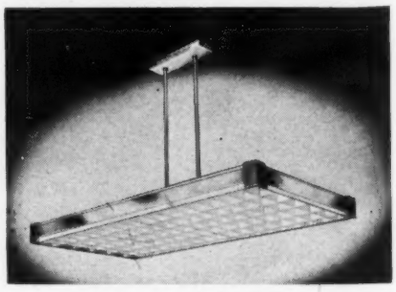
"Manhole tamper switch." **The Autocall Company**, Shelby, Ohio.

with manhole covers. It can be used in conjunction with supervisory equipment and is said to be watertight and weatherproof.

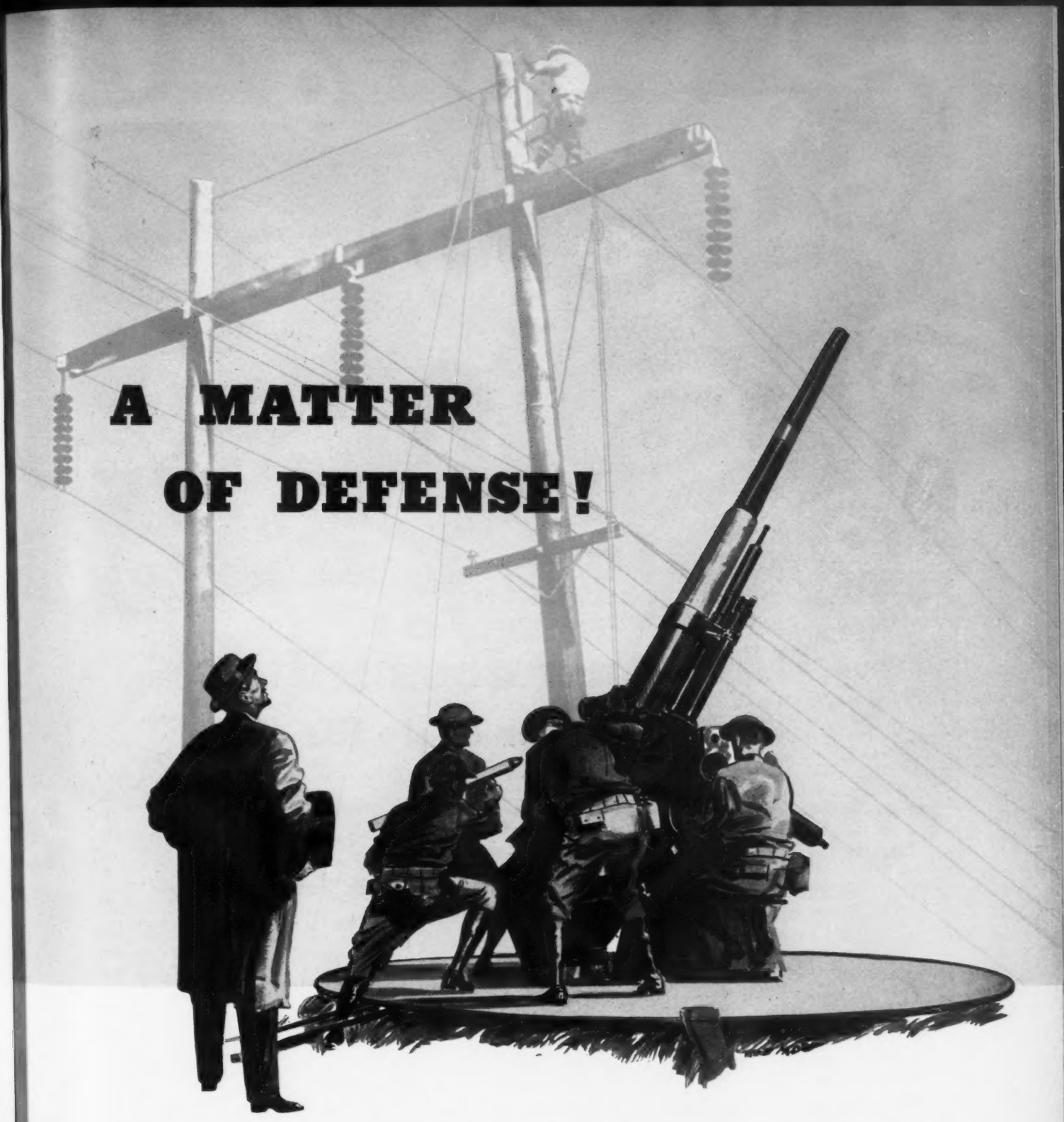
•

Lighting Unit

Fluorescent lighting unit is designed to provide direct distribution of light, approximately 90 percent downward. A narrow section immediately above each lamp is open to allow some illumination of the ceiling area. Louvers are provided to prevent direct view of lamps.



"The Ace" lighting unit. Two sizes: Uses four or six 40-watt fluorescent lamps. **The F. W. Wakefield Brass Co.**, Vermilion, Ohio.



A MATTER OF DEFENSE!

Every mile of Pole Line that YOU build is a matter of defense effort. Every watt that flows through your conductors is a contributing factor toward the production of a bomber, a battleship or a field-piece.

These instruments of warfare cannot be produced without power—and power cannot be utilized without electrical transmission and distribution systems built to defy the naturally destructive elements of corrosion, electrical strain from lightning and mechanical strain from wind and sleet.

Whether it is a matter of defense or just good, plain, everyday customer service, it has to be RELIABLE. The engineer who specifies Hubbard Pole Line Hardware for his lines is giving his customers that quality which is an assurance of reliability.

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An achievement of Anaconda research benefiting both American Industry and Defense

It is Anaconda's new construction known as Type CB*. It was born in the Anaconda laboratories when an engineer applied the principle of conditioning oil by the introduction of carbon black, in a series of experiments then being carried on.

This principle, when applied to paper-insulated oil-impregnated cable, more than trebled the life of the cable under accelerated aging tests.

The resourceful research that made this vast improvement in power cable continues unabated by the emergency. In fact, daily it strives to produce better wires and cables not only for all-important defense purposes, but also for industry at large. And although the latter may be delayed in obtaining new and improved products, when peace comes these products will be ready to go to work in the constructive cause of greater industrial progress. 41376

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ANACONDA WIRE AND CABLE

TECHNICAL LITERATURE

TRACK SWITCH HEATERS—Electric heaters for outdoor railroad track switches are described in a seven-page folder, giving heater length and wattage recommendations for typical application, methods of mounting, listing of auxiliaries, such as transformers, controls and feeder lines, and a typical bill of material covering switch heating equipment for staggered three-way turnouts. Copy of bulletin R-998, "Application of Electric Heaters to Railroad Track Switches" may be obtained from department 7-N-20, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

PROTECTIVE LIGHTING—Fence lighting, inside roadway, path and yard lighting and inside building lighting are the three main parts of a discussion on lighting for protection, in an article "Protective Lighting for American Industry," by Davis H. Tuck, electrical engineer, Holophane Co., Inc. Chart for determining foot-candles, diagram showing relative blinding effect of glare from lamps at different mounting heights, and candlepower curves are included in the data presented. Copies of the reprint from Illuminating Engineering, July, 1941, may be obtained from the Holophane Co., Inc., 342 Madison Ave., New York, N. Y.

ARC WELDING ELECTRODES—Data for cost estimates is provided in an eight-page publication. It includes consumption figures for bare and shielded arc electrodes on metal thicknesses commonly employed in making fillet welds, square, "V" and "U" groove butt joints and bevel and "J" grooves. Amount of steel deposited per linear foot of weld is shown. As a further aid on other joints not shown, the basic formulas used in these calculations are included. Copy of the "Electrode Consumption Calculator" may be obtained from Air Reduction, 60 East 42d St., New York, N. Y.

CANADIAN ELECTRICAL STANDARDS—Three approvals specifications under Part II of the Canadian Electrical Code have been issued, the requirements of which must be met in order to obtain C.E.S.A. approval of the electrical devices concerned. Specifications C22.2 No. 0-1941, "Definitions and General Requirements"; price 75 cents each. C22.2 No. 28-1941, "All-Asbestos and Asbestos Varnished-Cambric Insulated Wires and Cables" applies to wires and cables intended for use on supply circuits having maximum potentials of 300 or 600 volts; price 50 cents each. C22.2 No. 58-1941, "Isolating Switches (for High-Potential 'Disconnect' Use)" applies to air-break switches without inclosures, for potentials of from 751 to 15,000 volts inclusive for both indoor and outdoor use, a.c. or d.c.; price 50 cents each. For copies of the standards, address the secretary, Canadian Engineering Standards Association National Research Building, Ottawa, Canada.

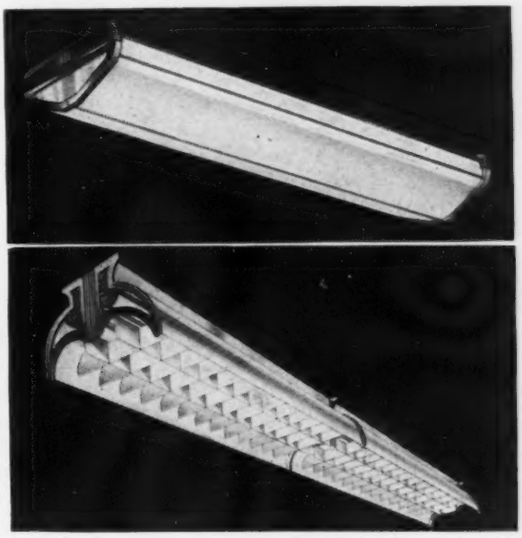
FATIGUE OF METALS—For conditions which limit the stress in metals by fatigue, a 45-page book covers subjects such as axial and shear combined and alternating stresses, tensile strength vs. fatigue limit, and corrosion fatigue. To combat the mechanical sore spots, a résumé of the most recent work is included with respect to nitrided Nitralloy. The book, "Fatigue of Metals, Some Facts for the Designing Engineer," may be obtained from the Nitralloy Corporation, 230 Park Ave., New York, N. Y.

You Can Safely Recommend

Guth FLUORESCENT Lighting

The Line Backed by 39 Years of Successful Experience

When your customers want information and recommendations on Fluorescent Lighting, give them the facts about GUTH Fluorescent. These quality Luminaires are engineered to deliver more light and better light, right where it's wanted; and they're built to uphold our 39-year reputation for quality! You win new friends and new prestige every time you recommend GUTH Fluorescent.



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GUTH Fluorescent is built ruggedly, has carefully tested High Power Factor accessories, and engineered permanent reflectors. Inspection by the Underwriters' Laboratories, Inc., and frequent factory checkups assure the highest quality at the lowest cost. Your specification of GUTH Fluorescent assures your customer "The Best Fluorescent Buy"!

GUTH Excelux

Trim, modern design for office and store lighting. Semi-Direct illumination. Full-screen lamp diffusion effected with either glass or plastic shield. Made for 4-40 or 6-40 watt Fluorescent Lamps.

GUTH Surface Troffer

May be installed as individual units or in continuous runs. Made for either 2 or 3 40-watt lamps per 48" section. Egg-crate Louvres provide 45° lamp shielding. "Add-on" Filament and GERMICIDAL LAMP sections are available.

Important Data for Utility Men

New GUTH Specification Sheets are just off the press—ready to help you figure a Fluorescent Job and show the prospect exactly what he is getting. Write today for complete set.

The EDWIN F. GUTH COMPANY 2615 Washington Ave. St. Louis, Mo.

"LEADERS IN LIGHTING SINCE 1902"

NEWS ABOUT PEOPLE

H. W. Leitch, Consolidated Vice-President, Retires

Howard W. Leitch, vice-president of Consolidated Edison Co. of New York, Inc., has retired. Mr. Leitch, who was employed by the electric company as a brushman 46 years ago, is the only man now in the Consolidated Edison system who took an active part in the evolution of the electric business from the early small plants to today's unified and interconnected organization. Mr. Leitch was made vice-president in charge of electrical operations in 1938, serving until 1940, when he passed the system's retirement age. Since then he has worked as consultant on special assignments.

Following graduation from Brooklyn Polytechnic Institute in 1895, he became

associated with the New York Edison's operating department. By 1905 he had been appointed chief system operator and two years later he was made assistant electrical superintendent at Waterside, the position from which he was selected in 1913 by United Electric Light & Power Co. to get the new Sherman Creek station under way. As electrical superintendent of power plants, Mr. Leitch took charge of this station during construction and seven years later the new Hell Gate plant was built under his supervision. In 1935, when United and New York Edison companies were consolidated, Mr. Leitch became associate chief operating engineer. In 1938 he was elected vice-president of the Consolidated Edison Co. in charge of electrical operations. He has served on many committees of the American Institute of Electrical Engineers, American Society of Mechanical Engineers and the former National Electric Light Association.

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▶ GEORGE STORMINGER, formerly general foreman, cable section, underground and transmission construction department, Public Service Electric & Gas Co., Newark, N. J., has been appointed assistant engineer and assigned special duties in connection with cable installation, engineering and developing work. Mr. Storminger has been connected with Public Service since 1912.

▶ LEWIS M. CLEMENT, director of research and engineering of the Crosley Corp., Cincinnati, Ohio, has been elected a vice-president of the corporation. Mr. Clement retains his responsibilities as director of research and engineering.

▶ L. A. WILLIAMS, for the past five years manager of the Everett district of the Puget Sound Power & Light Co., has been appointed as executive assistant to the president, Frank McLaughlin, with headquarters in Seattle. R. W. JOYCE, now assistant to the manager of the central division in Seattle, has been appointed to succeed Mr. Williams. J. W. WALLIN, manager of the company's office in Kirkland, will succeed Mr. Joyce. Mr. Williams has been with the Puget Sound utility for seven years, serving as advertising manager and advertising sales promotion director. He was transferred to Everett as manager in 1936.

F. H. Barton Joins Staff of Connecticut Utility

Fred H. Barton, formerly superintendent for the consulting firm of Gibbs & Hill, Inc., New York City, has joined the construction engineering staff of the

United Illuminating Co., New Haven and Bridgeport, Conn., reporting to the superintendent of distribution. In general, he will supervise the company's 1942 construction program in the distribution field and will also assist in the maintenance of the 69-kv. underground cable section of the Bridgeport-New Haven tie line in the latter city.

Mr. Barton was formerly employed by the Stone & Webster Engineering Corp., and while with Gibbs & Hill supervised the construction of the Pennsylvania Railroad electrification between New York and Washington, as well as the recently completed U. I. tie line above mentioned.

•

▶ THOMAS FRENCH, superintendent of distribution, Lowell (Mass.) Electric Light Corp., was recently made the recipient of a chest of silver dollars and a 50-year service pin at a dinner in his

ORANGEBURG HAS BEEN A LASTING NAME "UNDERGROUND" FOR 48 LONG YEARS

On estates
from Bar Harbor, Me.
to Pasadena, California . . .

it's ORANGEBURG *Standard*

for installations underground *with* concrete encasement—for main service and other installations where duct banks of four or more ducts are required.

it's ORANGEBURG NOCRETE

for installations underground *without* concrete encasement—for single, double, and triple duct service between residences, garages, green houses, swimming pools, fountains, stables, and for driveways and walk lighting.

Photograph by Nesmith

Build for tomorrow with

ORANGEBURG *Conduits*

MADE AT ORANGEBURG, NEW YORK, BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY

Sales Agent—Distributors

GRAYBAR ELECTRIC CO., INC. GENERAL ELECTRIC SUPPLY CORP. 11-FC-1

At Victor we KNOW our Type "R" *(Radio treated)* Insulators *Provide* NOISELESS TRANSMISSION

Here's a machine that listens to insulators. Under conditions which duplicate the requirements of your lines, we put Victor Type R, radio-proofed insulators through their paces and check them with our Radio Noise Interference Detector. If there are any faults which would cause annoyance to a power company's customers—out they go . . . . Just one more reason for the growing preference for Victor Insulators, Type R.

V *The Mark of a* **GOOD** *Insulator*

VICTOR INSULATORS, INC.
VICTOR, NEW YORK

honor. Mr. French is one of the few men in the New England Power Association group to wear the half-century emblem.

•

J. F. Eckel Will Direct Subcontracting for G. E.

Appointment of J. F. Eckel as supervisor of General Electric Co.'s subcontracting program has been announced by W. R. Burrows, vice-president in charge of manufacturing. In his new position Mr. Eckel heads up the direction of General Electric's subcontracting policies and practices, as set up by company officials, handling relations with subcontractors as well as interested defense officials. It has been General Electric's policy to subcontract whenever possible to expedite defense production.

Mr. Eckel is well qualified for his new position, since as co-ordinator of the manufacturing activities of General Electric's refrigerator department one of his responsibilities was the subcontracting of refrigerator parts. Entering the cost accounting department of the company's Schenectady plant in 1918, for the next seventeen years he was engaged in cost work in various departments. He was in charge of the refrigerator department cost accounting section when in 1935 he was appointed assistant co-ordinator of the manufacturing activities of the refrigerator department, not only at Schenectady but at other General Electric plants as well. In 1939 he became co-ordinator of that department.

•

▶ Douglas G. Wright will serve as acting chief of PWA's power division in place of K. S. Wingfield, resigned. Mr. Wright has been assistant director of the power division since last January. A graduate of the United States Naval

Horse-Sense SUGGESTIONS on FLUORESCENT LIGHTING—

You can save yourself a lot of headaches when you specify Fluorescent lighting equipment — and give your clients a lot more satisfaction — by following these four suggestions:

1. *Pick a manufacturer thoroughly experienced* in *fluorescent.* When you specify HYGRADE you get the benefits of the broadest experience in this field . . . for HYGRADE *pioneered* in fluorescent—has since brought out the *best* things *first* in fluorescent—has *exclusive patents* in fluorescent—and can therefore give you a *complete,* all-round *better* lighting job.

2. *Pick a manufacturer who believes in quality.* For over 40 years, HYGRADE has employed only the best — in engineering brains — materials — and fine workmanship. Results: Lamps that keep their brightness longer from end to end. Fixtures famous for long endurance, low maintenance, easy accessibility. Starters that really start and re-start. A complete line of quality-engineered equipment.

3. *Pick a manufacturer who stands behind his products.* HYGRADE makes everything for fluorescent lighting . . . gives a guarantee covering every part of every fixture!

4. *Pick a manufacturer whose equipment is easy to specify, and inexpensive to install.* HYGRADE designs, engineers, builds, assembles, ships and prices fluorescent fixtures COMPLETE.

Write today for free file-size kit—containing catalogue, prices, specification sheets. Dep't. EW3, HYGRADE Sylvania Corp., Salem, Mass. Est. 1901. Also makers of HYGRADE Incandescent Lamps and Sylvania Radio Tubes.

Brilliantly illuminated section of Sperry Gyroscope Company plant, Brooklyn, N. Y.

Many years of experience in LINE CLEARANCE TREE TRIMMING for PUBLIC UTILITY CORPORATIONS in many states has given the Bartlett Company intimate and expert knowledge of the special problems involved in this work. We solicit your inquiries!

The F. A. BARTLETT TREE EXPERT CO.

Research Laboratories & Experimental Grounds
Stamford, Connecticut

BARTLETT
TREE EXPERTS

The Bartlett Way

AVOID THE QUADRUPLE LOSSES
that accidents actually cost
—with the help of this new book

Investigation has proved that hidden, incidental costs of accidents in industrial and construction work—*the breakage of tools, spoilage of material, delays in production, lost time of co-workers, etc.*—average FOUR TIMES the direct cost of compensation and medical bills.

How to get the truest picture of conditions in your own concern, what remedies to choose, *and how to get them to work*, is shown in detail in this book:

NEW 2ND EDITION JUST OUT!

INDUSTRIAL ACCIDENT PREVENTION

By H. W. Heinrich, Assistant Superintendent, Engineering and Inspection Division, Travelers Insurance Co. Revised, up-to-date 2nd edition. 448 pages, 5½x8, 154 illustrations, $3.00

Here is a comprehensive manual of safety promotion, fully explaining the principles and methods by which industrial concerns may avoid monetary losses and delayed production arising from accidents. Filled with factual cases and data, the book shows exactly how to analyze the accident situation in a particular plant, find the causes, develop the remedies, and carry them out. Gives special emphasis to the human factor in safety work and how to deal with it to make preventive measures effectual.

14 MONEY-SAVING CHAPTERS

1. Principles of Accident Prevention
2. Basic Philosophy of Accident Prevention
3. Creating and Maintaining Interest in Safety
4. Fact Finding
5. Corrective Action
6. Machine, Prime-mover, and Power-transmission Guarding
7. Process and Procedure Revision
8. Safety Psychology
9. Fatigue
10. Occupational Disease
11. Illumination
12. Safety Organization — First Aid and Hospital
13. Accident Statistics
14. Education of Employees

EXAMINE THIS BOOK 10 DAYS FREE—SEND COUPON

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Send me Heinrich's Industrial Accident Prevention for 10 days examination on approval. In 10 days I will send $3.00 plus few cents postage, or return book prepaid. *(We pay postage on orders accompanied by remittance.)*

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(Books sent on approval in U. S. and Canada only.)

Academy, he has been with the Public Works Administration since its inception and for some time was chief project engineer for PWA in Nebraska on all power and irrigation projects. Mr. Wingfield will enter the private engineering and investment field with offices in Washington, D. C. He had been with PWA since 1933.

► ERIC GEERTZ, vice-president of Cardox Corp., Chicago, and head of that company's fire division, is chairman of a new special committee appointed by OPM, consisting of manufacturers of fire-extinguishing systems. Recognizing fire protection for all industry as an important defense measure, the OPM has called on manufacturers of fire-fighting installations to co-operate in making blanket protection of civilian and military establishments possible.

► JESSE H. LIDE has been appointed assistant general advertising manager of Westinghouse Electric & Manufacturing Co. with headquarters in the company's Pittsburgh office. Since September, 1940, Mr. Lide has been assistant advertising manager of the Westinghouse merchandising division in Mansfield, Ohio. He went to that position from Philadelphia, where he was merchandise sales promotion manager of the Middle Atlantic district. Mr. Lide joined Westinghouse in 1924, and after a year in the company's publicity department in East Pittsburgh he entered the advertising section in Mansfield, subsequently engaging in sales promotion in Atlanta. He left the company in 1929 to become advertising manager of the Rome Wire Co. in Rome, N. Y., and later general advertising manager of the General Cable Corp. He rejoined Westinghouse in 1931.

OBITUARY

William L. Goodwin

William L. Goodwin, whose name 20 years ago was on the tongue of every one in the electrical industry as the evangelist of market development through co-operation of all elements of the industry, died in White Plains, N. Y., on October 31, after a brief illness. He was 65 years old. At the time of his death Mr. Goodwin was the proprietor of a home maintenance business in Scarsdale, N. Y. Starting in business in California at the turn of the century, Mr. Goodwin developed a large electrical jobbing business with headquarters in San Francisco. Coming East, under the sponsorship of the General Electric Co., Mr. Goodwin promoted a co-operative merchandising plan for the electrical business which had for its purpose the improvement of internal

DESIGNED FOR TOMORROW'S NEEDS

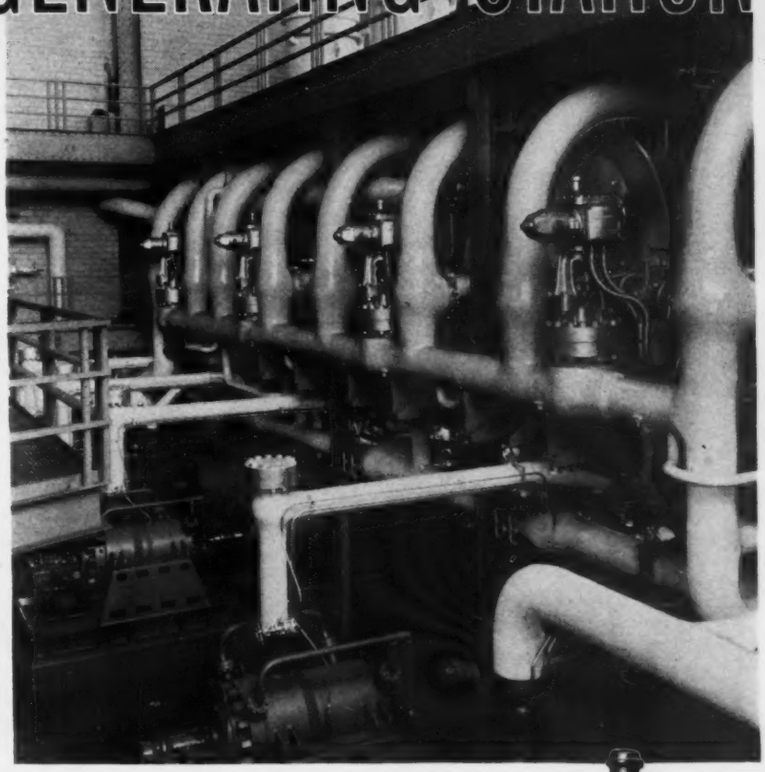
BURLINGTON GENERATING STATION

OF PUBLIC SERVICE ELECTRIC and GAS COMPANY

Chooses

PHILADELPHIA

LIMITORQUE VALVE CONTROLS



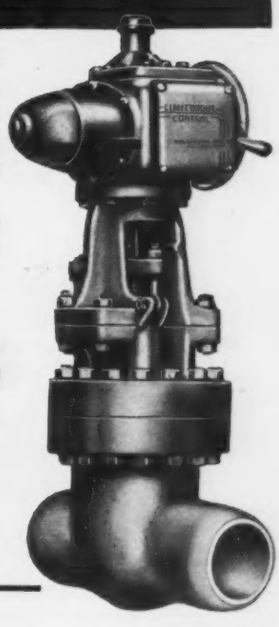
83 Limitorque Valve Operators have been installed in Burlington, the station that a number of central station engineers recently designated as tops in design representing stable trends for the future.

The choice of Limitorque Controls for Burlington was based on practical experience gained by the Public Service Electric and Gas Company since 1916 when they first installed motor operated valves. Also playing an important part in the present selection was the dependable service obtained from Limitorque Controls in other stations of this company.

Limitorque Controls are reliable . . . providing at Burlington centralized push button control of valves ranging from those on 12"-1250 pound steam lines to those on 3"-300 pound oil lines, and on water from 48" gate valves to 9' wide x 10' high sluice gates . . . in normal, every day operation of the station as well as for emergency and safety purposes.

When designing new plants, or for securing more dependable control in existing stations . . . investigate Limitorque. They can be fitted to all makes of valves up to 96" diameter and are adaptable to present equipment.

Literature describing the various types of Limitorque Controls will be sent on request. Write today.



PHILADELPHIA GEAR WORKS

LIMITORQUE DIVISION
Erie Ave. and G Street
Philadelphia, Pa.
NEW YORK CHICAGO PITTSBURGH

NEED WIRE? *Salvage those Short Pieces with*

Nicopress

Nicopress Sleeve

Completed Nicopress Splice

Nicopress compression sleeves provide a most efficient and economical method of making short wire lengths available for further use.

Note how easily Nicopress Splices are made.

The work is quickly done and the completed splices are small and neat, very little more in diameter than the wire itself. Splices are tight and strong, exceeding the rated breaking strength of the wire. Order Nicopress from your jobber today.

The wire coils easily when spliced the Nicopress Way.

THE NATIONAL TELEPHONE SUPPLY CO.

5100 Superior Ave. Cleveland, Ohio

Canadian Mfr., N. Slater Co., Ltd., Hamilton, Ont. Export Distributor

International Standard Electric Corp., New York, N. Y.

electrical trade conditions. His election as operating vice-president of the Society for Electrical Development followed. Six years later he resigned from the S.E.D. to enter private business as president of Goodwin, Morton & Badrian, Inc., merchandising counsellors. Subsequently he served as president of the Armstrong Electric & Manufacturing Corp., with headquarters in New York.

•

▶ MALCOLM C. CLEVELAND, formerly chief engineer of the New York Public Service Commission, died at his home in Shrewsbury, N. J., on October 31, at the age of 64. Mr. Cleveland was born in Wellesley Hills, Mass., and was graduated from the Case School of Applied Science in Cleveland in 1901. For many years he engaged in railroad work before being appointed chief engineer of the New York commission in 1931. He retired from this position on October 1, 1940.

▶ GEORGE S. LAWLER, 67, chief electrical engineer of the Associated Factory Mutual Fire Insurance Companies, Boston, died at Lynn, Mass., on October 31, from a relapse after an operation. One of the foremost authorities in the country upon electrical fire hazards, Mr. Lawler, as a member of the electrical committee, N.F.P.A., was long influential in the preparation of the National Electrical Code. He was born in Boston and was graduated in electrical engineering from the Massachusetts Institute of Technology in 1897. For six years he was employed by the Boston Elevated Railway in electrical operation, then becoming assistant superintendent of the Williamsburg power station of the Brooklyn Rapid Transit Co. Joining the Factory Mutual organization in 1906, he became head of its electrical engineering activities a year later.

▶ JOHN FITZGERALD, manager of the Arkansas Power & Light Co. at Camden, Ark., died, of heart failure, on October 11. Mr. Fitzgerald was only 35 years of age. He had been with the company since 1929, having served at Searcy, Walnut Ridge and Newport before going to Camden.

▶ A. G. MONTGOMERY, assistant chief engineer of the American Steel & Wire Co., died at St. Alexis Hospital in Cleveland on October 10. A graduate of Pennsylvania State College in electrical engineering, Mr. Montgomery joined the American Steel & Wire Co. as district engineer in Pittsburgh in 1914. He had held a variety of engineering positions with the company in Pittsburgh and Cleveland and was appointed assistant chief engineer in 1939.

Originators OF THE MACHINE SHAVING Process ON CEDAR

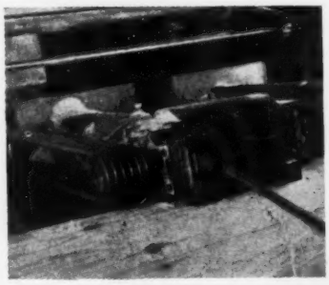
DURAPOLE

first cedar pole with extended life above the ground

The DURAPOLE—full length machine shaving and full length creosote treatment gives you a cedar pole with definite increased service life over the standard butt treated pole.

The DURAPOLE, because of full length creosote treating, has much improved appearance in its smooth surface and chocolate brown color.

The DURAPOLE is slab gained to insure perfect drainage—to save on maintenance—to add to appearance—to make possible secure arming.



The DURAPOLE has ½" guaranteed penetration butt treatment—no reduction in sapwood in butt section.

VALENTINE CLARK CORPORATION

2516 DOSWELL AVE., ST. PAUL, MINN.

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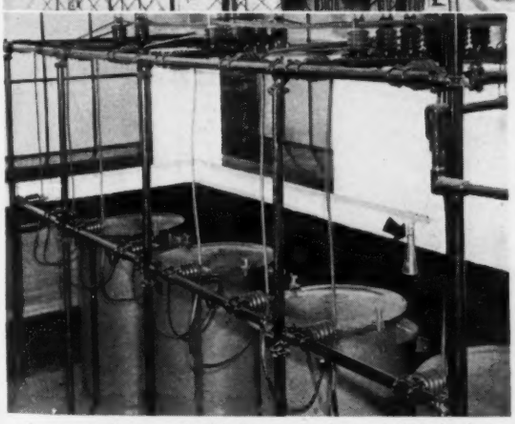
MOBILIZE FOR DEFENSE AGAINST FIRE . . .



Arrow indicates shielded nozzle from LUX built-in extinguishing system which guards transformer vault.

You can't always prevent fire. *Yet you can control it* . . . extinguish it quickly with minimum damage, minimum outage.

All-out production for defense means all-out defense of production. Utility companies recognize their obligation to keep delivering power . . . to allow no service interruption caused by fire. They are calling on LUX built-in carbon dioxide extinguishing systems and LUX portable fire-fighters to kill fires fast.

LUX systems guard all kinds of rotating electrical machinery—generators, condensers, converters, motors. LUX total-flooding installations protect oil switch rooms, transformer vaults, control rooms and cable spaces. The new LUX trailer units give fast mobility and quick extinguishing action against fires in manholes and underground vaults. LUX portable extinguishers guard a myriad of smaller hazards —motors, switchboards, and the like.

When you're planning, don't forget fire protection. And for speedy, sure extinguishing remember LUX.

LUX
SNUFFS OUT FIRE

Walter Kidde & Company

Incorporated

1128 West Street, Bloomfield, N. J.

MANUFACTURING-MARKETS

Seeks Copper Wire Price Maintenance

Manufacturers of copper wire and cable have been requested not to exceed their October 15 prices, in a letter sent to them by Leon Henderson, OPA Administrator.

This represents the first of a series of steps in Mr. Henderson's recently announced program to stabilize prices of all products made of copper, brass or other copper-base alloys. The program is made necessary by the serious copper shortage caused by heavy defense demands and by the OPM conservation order of October 21 sharply restricting use of copper for many products.

The Administrator's letter draws attention to the fact that the OPM conservation order excludes from its restrictions the use of copper and copper-base alloys in articles primarily employed as conductors of electricity, and adds: "We would hope . . . that the restriction of civilian demand and the assurance of copper supplies for your industry may bring about a situation that will permit of somewhat lower prices."

In this connection, conferences with representative members of the copper wire and cable industry will be called by OPA in the near future to discuss recent trends in costs and prices. Many types of copper wire and cable currently are selling from 20 to 30 percent above 1939 levels, OPA states.

Manufacturers are asked in the letter to inform OPA of all changes in prices or terms of sale since January 1, 1940.

•

Shasta Turbine Contract Goes to Allis-Chalmers

A turbine and governor for the fifth large generating unit at Shasta Dam power plant on the Central Valley reclamation project in California has recently been ordered. Allis-Chalmers Manufacturing Co. will furnish this power equipment on its bid of $616,800.

The contract calls for one vertical-shaft, 103,000-hp. hydraulic turbine and one governor with pumping equipment. With this turbine and governor all the essential power equipment for the fifth unit has been ordered. Contract for a 75,000-kw. generator was awarded earlier this fall to General Electric Co.

•

T. & D. Equipment Orders Hit New High

Reversing the trend of August, the NEMA index of orders received for motors and generators moved upward in September 63.9 points to 370.9 from the August index of 307.0, an increase of 20.8 percent.

The index of orders received for transmission and distribution equipment also reversed the downward movement reported in August and moved to a new high. This index advanced 71.6 points in September to 360.4 from the revised August index of 288.8, an increase of 24.8 percent. The July index revised to 335.9 from 342.5.

NEMA INDEX, value of orders received for motors (large d.c. polyphase synchronous) and generators (engine, belt-driven); also for transmission and distribution equipment

Washer Industry Pools Facilities

Easy Washing Machine Corp. of Syracuse, Apex Electrical Manufacturing Corp. of Cleveland, Ohio, and Nineteen Hundred Corp., of St. Joseph, Mich., the three prime contractors, who were recently awarded a $12,000,000 defense contract for the manufacture of gun mounts, have arranged to pool their personnel into various divisions under the supervision of Wilburt H. Winters, formerly vice-president of American Brake Shoe & Foundry Co., as chief defense co-ordinator. The divisions consist of inspection, purchasing and planning, accounting and subcontracts and tool design and production.

Responsibility for the entire tooling

program to manufacture this mount has been assigned to the Easy Washing Machine Corp. The tooling will be under the direction of Elmer C. Cooley, chief tool design engineer of the corporation, who will also be chief tool design engineer for the washing machine industry.

At a recent meeting of companies of the industry in Chicago it was announced that the policy of the prime contractors would be to spread the work and sub-contract to as many of the 34 washing machine manufacturers in the industry as are willing to participate.

This is the first attempt to spread defense work on an industry-wide basis by the contract distribution division of OPM under the supervision of Floyd Odlum, in co-operation with the War Department and the Army Ordnance. The purpose of this program is to pool the facilities of the larger manufacturers with the smaller manufacturers, to utilize their present facilities, and prevent unemployment due to curtailment of the manufacture of washing and ironing machines under the recent order issued by Donald M. Nelson, director of the priorities division of OPM, as well as unemployment resulting from priorities on materials required for defense work.

•

Place Appliance Orders for Defense Housing

Seattle Housing Authority has awarded contracts for 500 electric ranges and 500 electric refrigerators for the Rainier Vista homes, the defense-housing project on Beacon Hill. The refrigerator award was made to the Crosley Corp. on a bid of $44,675 and the range award to the Edison General Electric Appliance Co. for $21,715. Half of each order is to be delivered by December 3 and the remainder by January 22.

•

Expands Plant for Defense

To meet expanded defense requirements with minimum interference to its regular production, the International Resistance Co. has added approximately 30 percent more manufacturing space at 401 North Broad Street, Philadelphia.

New York Metal Prices

	Nov. 11,'41 Cents per Pound	Nov. 4,'41 Cents per Pound
Copper electrolytic	12.00*	12.00*
Lead, A. S. & R. Price	5.85	5.85
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc Spot	8.64	8.64
Tin, Straits	52.00	52.00
Aluminum, 99 percent	15.00	15.00

*Delivery Connecticut Valley.

Field Reports on Business

With production now almost at the "ceiling," further expansion in defense production will be obtained by curtailment of non-defense services. Electric equipment sales advanced. Retail trade is expected to rebound from the October slump before the end of this month. Appliance dealers are well stocked for Christmas selling and few shortages are anticipated.

NEW YORK

Predictions are being made that industrial production during 1942 will reach a peak level some 10 percent above the highest rate achieved during the current year. Unofficial estimates indicate that production this year, in terms of the Federal Reserve Board of Industrial Production, will average 155 percent of the 1935–39 average.

Electrical equipment industry recovered in September from the sales decline in August. Motors and generators index of orders rose 20.8 percent and transmission and distribution equipment index of orders rose 24.8 percent, according to NEMA. Electric power production continues close to the yearly peak thus far, but reflects a failure of industrial demand to increase at the rate in earlier months this year.

Engineering construction awards for the short week due to the Election Day holiday totaled $44,209,000, a decrease of 44 percent from the volume for the corresponding week last year, as reported by *Engineering News-Record*. The week's total brought 1941 construction volume to $5,294,419,000, an increase of 61 percent over the 45-week period last year.

With purchasing power at record levels and supplies of merchandise in stores' hands ample, retail trade, which suffered a slump in October, is expected to reach a higher level of activity this month. Last week department store sales in the metropolitan area showed an increase of 4 percent, in comparison with the corresponding week last year.

NEW ENGLAND

Utility and industrial power generating machinery are highlights in the electrical market in this district. A 35,000-kw, 70 percent power-factor G. E. turbo-generator has been bought for the Somerset station of the Montaup Electric Co. Due to low water conditions in Northern New England the installation of several steam turbo-generators, reconditioned units obtained from plants not engaged in war defense production, has stimulated the buying of switchgear apparatus. A Connecticut metal working plant is adding 3,000 kva. in transformer capacity to speed up shell production. A Massachusetts utility is planning for a new steam boiler and a Northern New England paper company has added a reconditioned 7,500-kw. G. E. turbo-generator and purchased switch and control apparatus.

Massachusetts boiler manufacturers are busy on war orders and installing welding equipment. One plant recently purchased four 20-hp., two 15-hp. and one 10-hp. units and last week announced the addition of four 20-hp. welders. Another well-known plant has installed a 125-kva. welding unit, and shipyard buying of welding units is steady. It is reported that shipyards in this area may employ 2,000 more experienced welders and are planning to expand their welding facilities to this end.

Small motor sales are active. Machine builders are buying 10-hp. motors in good volume, one lot of 69 going to a prominent machine builder lately, another consisting of 45 3-hp. to 10-hp. units purchased for installation on grinders and finishing machines, and a group of 10-hp. motors was recently sold for use on heavy gun barrel boring machines.

CHICAGO

Production, employment and trade maintained a high level of activity in this district during October, but there was a noticeable slackening in the upward trend. This was attributed largely to the transition from civilian to defense production, which caused considerable dislocation in many industries. Retail trade recovered somewhat from the recession during October and department store sales stood at a level 19 percent over a year ago.

Last week's electric power output of the Commonwealth Edison Company was the highest on record and showed an increase of 13 percent over the same period last year. Reports from the Fall Market Exposition now in progress indicate buyers are placing large orders for household appliances, refrigerators, washing and ironing machines and lamps.

Defense contracts placed in this area last week totaled $15,853,000, including orders for electrical equipment as follows: Rauland Corp., transmitting apparatus, $58,292; Galvin Manufacturing Co., radio receivers, $1,736,042; Teletype Corporation, teletype and maintenance equipment, $991,634; Cutler-Hammer, Inc., rheostats, $16,920; International Machine Tool Co., motors, $11,696; Pioneer Gen-E-Motor Co., dynamotor units, $20,939; American Automatic Electric Sales Co., telephone and switchboard equipment, $195,252.

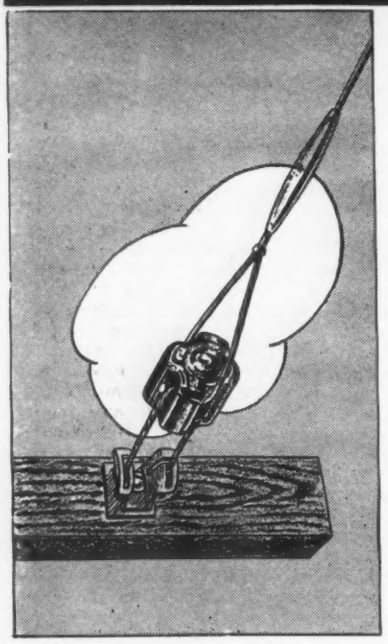
PACIFIC COAST

The decision to place under a good priority rating the maintenance needs of nearly all industrials is encouraging to Pacific Coast firms, because much of such material is electrical. Wholesalers are endeavoring to bill and ship as many deferred shipments to Pacific and Alaska bases as possible, both to reduce stocks prior to inventory and to justify the large quantities still on hand.

Varied orders include $358,882 to General Electric and $143,500 to Westinghouse for circuit breakers and $148,000 to Bowie Switch for 28 disconnecting switches, all for Grand Coulee, and a low bid of $113,800 covering automatic telephone and fire alarm systems, complete with auxiliary generator and panels, for naval ammunition dump at Hawthorne, Nev.

New appropriations are mainly additional works, such as $8,700,990 to Riverside, Calif., for Air Corps; $3,291,820 to San Diego naval training station; $1,100,000 to Mather Field near Sacramento, and $438,181 to Air Corps at Long Beach. Potential industrial business is forecast by a $600,000 additional loan to Olin Corp., part of a $5,000,000 aluminum plant near Tacoma; an OPM recommendation for a $500,000 tin plate mill addition to Columbia Steel plant at Pittsburg, on upper San Francisco Bay, and much fabricated steel for the Northwest power networks.

modernize
YOUR
DISTRIBUTION
PRACTICE—



RELIABLE
STRAIGHTLINE
SPLICE ADAPTER

Reliable double D deadend - adapters permit deadending with a standard splice — easily slipped around a spool or through a strain insulator.

For economy in stocking, and convenience in installation.

Will hold wire to full breaking strength.

Reliable
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO ILLINOIS

Pattern Being Set for Handling Power Shortage

[*Continued from page 71*]

the following week so that consumers may be warned when they have exhausted their quota—and discontinue service if consumption continues. Utilities also have the job of spot checking customer meter readings.

Reasons for setting up both the blackout and quota machinery in this fashion stems partly from Krug's desire to permit utilities and customers a maximum latitude in working out the program requirements cooperatively, and partly because of the joint liability imposed upon utilities and consumers in Nelson's order—as in all priorities orders. The order stipulates that consumers shall not take energy for a prohibited use or in excess of quotas, and that utilities shall not supply energy to permit a violation.

Again, in classifying consumers came the myriad of questions on border-line cases. After conferring with utility representatives, Krug agreed that meat packers, dairies and manufacturers of dairy products, bakeries and abbatoirs come within the scope of "food preservation plants," one of the general exemptions listed in the order. Hotels, whose spokesmen contended they couldn't regulate guests' use of electricity, were denied exemption, and so were commercial laundries.

Studied Exemptions

Not all defense production gets a green light, either. Steel companies, for instance, were not given a blanket exemption. A special representative of OPM's steel section went to Atlanta to give individual consideration to these cases and make recommendations to Krug.

A special formula was worked out for the textile mills, biggest industry threatened with curtailment. With the consent of the Army Quartermaster Corps, mills on a seven-day week will reduce to five days, curtailing both Army and civilian production, only proviso being that in so far as possible Army orders get precedence in scheduling the five days' output. Mills on a six-day will work, alternately, five-day and four-day weeks once curtailment becomes effective.

Economic factors entered into this textile formula, in addition to the fact that this arrangement helps stabilize load curves. If the mills were required to continue full shifts on Army orders and arrange to take all curtailment from civilian output, some looms would go all the time, others a couple or three days a week, still others not at all. This would make for less control over energy demands, as well as throw some employees out of work, while keeping others at full time. Utilities and mill operators worked out staggered schedules of five-day operations so as to maintain an even demand through the week.

Court of Appeals

The administrative procedure also has a route for appeals from consumers not given exempt status or not content with their quotas. Their first stop is their own utility, for an explanation of their case; utilities cannot change their status, can only attempt to pacify them. If still not satisfied, they go to Krug, but without support from the utility, an appeal has little chance with Krug's staff. Where plants were shut down in the base period by strikes or failure of the priorities system to get them normal supplies of raw materials, a higher quota is usually given. But ordinary fluctuation in operation, seasonal or otherwise, isn't enough argument.

Georgia and Alabama have been all through this program before, but on a voluntary basis. That was last spring, when a similar crisis in hydro storage occurred, and the program was unusually successful in the C&S territory. There is a sub-surface difference in reaction this time in those states. Compliance was general to the blackout provisions, and consumers scheduled for the rationing fell into line with necessary advance arrangements. But compliance, in many quarters, was perfunctory and limited to the letter rather than the spirit of the order.

Partly, that's sectional antagonism to being ordered about by Washington. Even more, the attitude can be traced to a feeling that this may be another cry of "wolf, wolf"; the Ickes oil fiasco is often cited and has shaken confidence in mass restrictions attributed to the war. And outside of Tennessee, there exists scattered sentiment that the whole program is de-

signed to "bail out" either TVA or Aluminum Co. of America; in the Carolinas, they say it's to "bail out" C&S and TVA.

Krug and his staff know of these mutterings, but in their activities they have provided little or no fuel for such talk to feed on—unless it was in postponing the percentage curtailment. Within the staff, there was a feeling that postponement would strengthen the cause of those who liken the program to the gasoline restrictions. But when it came time to decide, the decision was against protecting personal standing, in favor of any reasonable opportunity to avoid giving business, industry and wages a stiff dollar blow.

It cannot be said, of course, that any future rationing program brought on by the war will follow the exact pattern laid down at Atlanta. For instance, there is no generator capacity shortage nor peak-load factor in this instance, which might, in another region, require different arrangements. But the broad policies followed by Krug and his aids in the Southeast problem — of taking off their coats and working with utilities and affected consumers rather than simply issuing orders, and of trying every device to minimize or avoid paralyzing industrial, commercial and utility business—can be counted as precedents.

•

Fairbanks, Morse Will Build New Diesel Plant

Announcement has been made by Fairbanks, Morse & Co. that a "letter of intent" has been issued by Secretary of the Navy Frank Knox, authorizing the expenditure of 5½ million dollars for a new building and additional equipment and machinery at the Beloit, Wis., works of the company.

The purpose of this new plant is to triple the production of Fairbanks-Morse Diesel engines for the Navy. Terms of agreement between the Navy Department and the company call for completion of the plant, the installation of the machinery and equipment, and a large scale production of marine Diesels in about a year's time.

In addition to the men required for the construction work and installation of the equipment, the project will mean the addition, in the near future, of at least 1,200 to 1,500 more factory employees to the company's present payroll.

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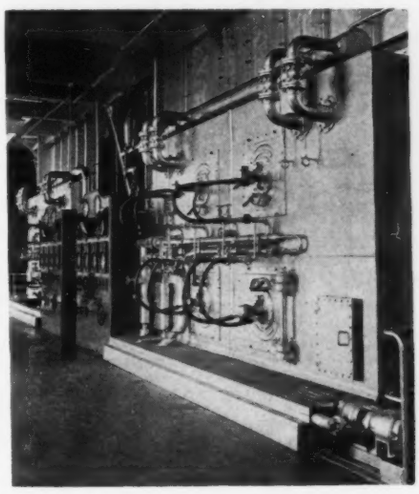
Wherever Electric Power is Generated by Steam

Central Stations firing oil, gas, pulverized coal and even waste fuels use Peabody Burners because of their long established reliability and proven efficiency.



56 NEW Central Station INSTALLATIONS

have been purchased in recent months for public utility service in power generating plants throughout the Americas and in the Hawaiian Islands. Of these, one-half were repeat orders, the best possible evidence of satisfactory performance and of confidence in Peabody equipment.

Because electric service must be dependable, because fuels must be fully utilized, because output must follow the load curve wherever it goes, the Electric Industry chooses Peabody Burners; built by an organization that has concentrated for decades on improvement of design and performance of combustion equipment.

Profit by the experience of those whose primary business is the generation of power and standardize on Peabody combustion equipment. Peabody engineers welcome opportunities to study your requirements and to submit recommendations.

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An efficient, economical form of portable illumination—giving daylight vision for night repairs and line patrol work. Unaffected by wind, rain or snow. Two sizes—20 or 30 minute lighting periods.

Central Linemen's Flare Lights are invaluable during outages or other emergencies when quick dependable illumination is imperative. Easily lighted in any weather by self contained friction cap. No matches required. Stick in a post, tree, cross arm, in the ground or carry by hand.

They're always ready, and provide ample illumination. Standard equipment with prominent utilities throughout the land.

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Utility men: Send for free sample on your company letterhead.

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LETTERS TO THE EDITOR

Distribution Transformer Loading Studies

To the Editor of ELECTRICAL WORLD:

The editorial "Distribution Transformer Loading Studies," in your September 6 issue, contains a very convincing statement of the value of investigating transformer loads and capacity. It would seem, however, that you have overemphasized its importance by using figures that are rather obviously in error.

Since you refer to the E.E.I. report, which contained data of this nature, it may be supposed that your figures are from that source. You state: "With distribution transformers often constituting nearly one-sixth of utility system investment, every one percent that average transformer loading . . . total system capacity investment . . ." It may be assumed that you are quoting from E.E.I. Publication H-6 or from a previous E.E.I. Publication F-7: "Distribution transformer investment was given as of the order of 15 percent of the total investment in plant to serve residential and small commercial load."

There is obviously quite a difference between the investment in distribution facilities and the total system investment. Actually, the same data from which the statement quoted above is derived went on to explain that distribution transformers constitute something like 2¾ percent of the total investment in electrical plant.

Because the purpose of our committee in the E.E.I. was to increase interest in and to make available data on the general subject of transformer loading and operation, we are glad to see the mention of this subject on the editorial page. I believe that the figures that have been used in our reports are impressive enough without any further enlargement in their relative importance.

FRANK SANFORD,
Chairman, E.E.I. Subcommittee
Distribution Transformer Practices.

•

Impact Resistance of Insulators

To the Editor of ELECTRICAL WORLD:

With reference to the article "Insulators as Rock and Bullet Targets," by J. J. Taylor, which appeared on page

The MOST COMPLETE LINE OF *Service Connectors*

LARGEST VARIETY of types, and a COMPLETE range of sizes. For all kinds of conductors.

Popular connector at left is carried in stock in ALL sizes, up to 1,000,000 CM. Furnished with or without retainer.

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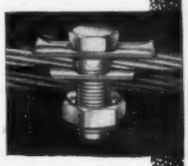
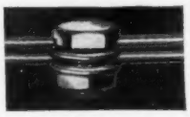
MADE IN OUR OWN PLANT under engineering supervision. Bodies and nuts precision machine-threaded for perfect fit. No sharp edges.

ALUMINUM Connectors machined from hard drawn rod, with forged spacers.



SERVICE POST Connectors for one or more conductors; many types.

SERVICE ENTRANCE Connectors with extruded copper bodies, Everdur screws.



TELEPHONE Service Connectors, brass rod—plain, nickel plated or tinned.

AND THOUSANDS MORE. Every connector Dependable. Preferred by leading utilities and "industrials," and manufacturers of electrical equipment.
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ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

108 of the ELECTRICAL WORLD of June 14, 1941, your readers may be interested to know that we made a series of tests on the impact resistance of porcelain and toughened glass insulators with a view to assessment of their resistance to stone throwing. The results were published in the *Journal* of the Institution of Electrical Engineers, Vol. 87, pages 645-651, December, 1940.

It was deduced mathematically that, assuming the angle of elevation of an insulator with respect to the thrower is 60 deg. (probable from physiological considerations) and the height of the insulator is 25 ft. (where damage is more frequently experienced), missiles aimed with a relatively wide range of angles and velocities of projection may succeed in striking the insulator. Furthermore, a fast, low trajectory missile permits a greater tolerance in aim and speed than a dropping missile, *i.e.*, downward blow on the top shed of an insulator is relatively unlikely.

The experimental work consisted of impact tests on insulators orientated at various angles with respect to direction of blow in a pendulum type machine. The magnitude of the fracturing energies obtained was such as to demonstrate that in all cases a well-aimed stone would in general strike an insulator with sufficient energy to fracture it. This indicated that the nature of the damage done was of greater importance than the fracturing energies as a basis of comparison. Thus the results in general indicated that a porcelain insulator hit by a stone is less likely to cause a fault on account of the damage sustained than would a glass insulator.

On the other hand, the damage done to a glass insulator is immediately obvious, whereas a porcelain insulator may be so damaged as subsequently to cause trouble, but the damage may not be easily detectable. There is as yet no consensus of opinion as to the relative importance of these factors.

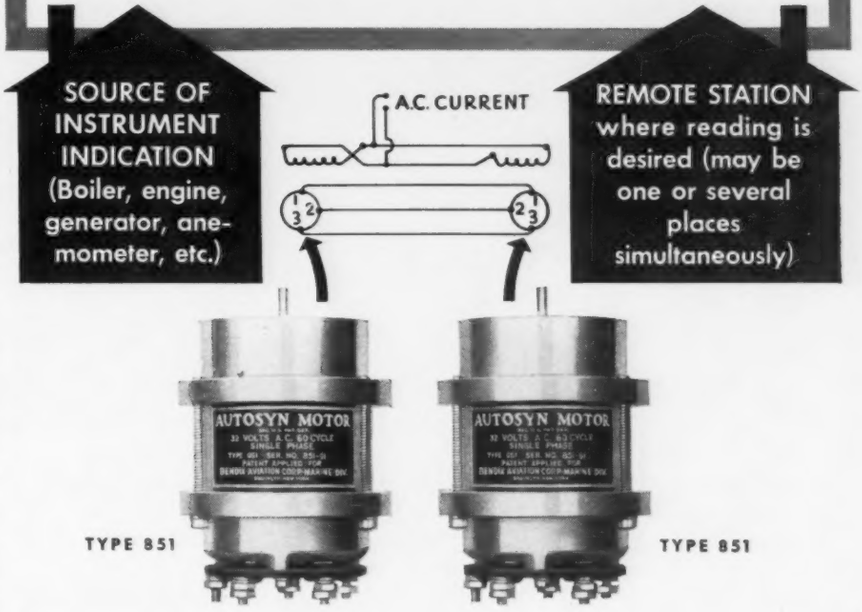
A. MORRIS THOMAS,
Senior Technical Assistant
E.R.A. Research Laboratory,
Greenford, Middlesex, England.

•

Announce Reorganization

Organization of the Wil-Son Manufacturing Corp., Chicago, has just been announced. This new corporation is a reorganization of Wilson Lighting, Inc., and is the successor to the Wilson Sales Co., Inc., and the Wilson Manufacturing Co. Wesley Wilson, who founded Wilson Lighting, Inc., is president of the newly organized corporation.

How to provide remote readings of almost any instrument—*efficiently, reliably and simply*


SOURCE OF INSTRUMENT INDICATION (Boiler, engine, generator, anemometer, etc.)
A.C. CURRENT
REMOTE STATION where reading is desired (may be one or several places simultaneously)
AUTOSYN MOTOR
AUTOSYN MOTOR
TYPE 851
TYPE 851

Just use a pair of

BENDIX-CORY

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SELF-SYNCHRONIZING

SIGNALING UNITS

WHEN it is desirable to be able to read an instrument indication at a distance from its source—perhaps at more than one point simultaneously—Bendix-Cory Autosyn provides the simplest, surest means ever devised. Wired as shown above, the armatures of both "motors" move in unison within an accuracy range of 1° plus or minus (½° on special order). The character of the indication to be transmitted makes little difference—it may be pressure, rate-of-flow, count, dimension, liquid level, voltage, amperage, resistance, temperature. Bendix-Cory Autosyn units are made in several sizes and types. Type 851 (illustrated) produces 2.5 inch-ounces of torque at 90° angular displacement—safe continuous operating torque 1.1 inch-ounces—dimensions 2⅜" x 3 15/32". One transmitting unit can actuate several variously located receiving units. Autosyns are standard for industrial instrumentation systems. Interested engineers are invited to write—

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REA Allots Funds; Contracts Approved

Rural Electrification Administrator Harry Slattery recently announced approval of loans to sixteen power systems in twelve states, totaling $3,160,000. This brings the total REA loans to $418,808,821, of which $49,981,200 represents operations during the current fiscal year.

Two of these new allotments are to set up new power systems in Kansas and Texas; one is for additional generating facilities in Florida, and the rest will expand already existing power systems.

Among the recent allotments are the following:

FLORIDA — Clay Electric Cooperative Assn., Inc., Keystone Heights, A. G. Loudon, supt., $105,000 for additional generating facilities. West Florida Electric Cooperative Assn., Inc., Graceville, Claude H. Smith, supt., $217,000 to build 261 miles of line, 705 members in Holmes, Jackson, Washington and Calhoun counties.

GEORGIA—Troup County Electric Membership Corp., LaGrange, C. E. West, supt., $105,000 to build 112 miles of line, 369 members in Harris, Troup, Meriwether, Heard and Muscogee counties, Georgia, and Chambers County, Alabama.

INDIANA—Carroll County REMC, Delphi, Clarence Darragh, manager, $63,000 to build 62.1 miles of line, 198 members in Carroll, Cass, Clinton, Howard, Tippecanoe and White counties.

IOWA—T.I.P. Rural Electric Cooperative, Brooklyn, Irvin L. Nervig, manager, $206,000 to build 274 miles of line, 719 members in Iowa, Poweshiek, Keokuk, Tama, Johnson and Benton counties.

KANSAS—The Ninnescah Rural Electric Cooperative Assn., Inc., Pratt, Lewis Trimpe, president, $183,000 to build 228.62 miles of line, 358 members in Pratt, Edwards, Reno, Stafford, Pawnee and Kiowa counties. Sugar Valley Electric Cooperative Assn., Mound City, J. A. Martin, president, $160,000 to build 177.35 miles of line, 410 members in Linn and Anderson counties.

MINNESOTA—Northern Electric Cooperative Assn., Virginia, Fritz E. Anderson, supt., $249,000 to build 296 miles of line, 939 members in St. Louis County.

MISSOURI—Crawford Electric Cooperative, Inc., Bourbon, R. L. Mook, president, $387,000 to build 407 miles of distribution line, 1,030 members in Franklin, Jefferson, Washington, Crawford, Gasconade and Iron counties.

NEBRASKA — Roosevelt Rural Public Power District, Mitchell, C. A. Keebaugh, supt., $33,000 to build 29.8 miles of line, 66 members in Sioux and Scotts Bluff counties. McCook Public Power District, McCook, George H. Myers, acting supt., $145,000 to build 95 miles and a substation, 295 members in Redwillow, Furnas, Frontier and Gosper counties.

NORTH CAROLINA—South River Electric Membership Corp., Stedman, R. R. Edwards, supt., $448,000 to build 451 miles of line, 1,750 members in Bladen, Duplin, Cumberland, Harnett, Johnston and Sampson counties.

Special pre-Christmas offer:

YOUR NAME STAMPED IN GOLD

ON THE COVER OF THIS NEW BOOK

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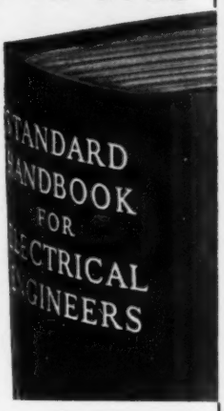

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OHIO—Buckeye Rural Electric Cooperative, Inc., Gallipolis, John R. Lusher, supt., $330,000 to build 312 miles of line, 971 members in Gallia, Jackson, Vinton, Meigs and Athens counties.

PENNSYLVANIA—Valley Rural Electric Cooperative, Inc., Martinsburg, John Denton, manager, $219,000 to build 194 miles of line, 574 members in Huntingdon, Fulton, Blair, Franklin and Mifflin counties.

TEXAS—Hall County Electric Cooperative, Inc., Memphis, T. E. Lenoir, supt., $131,000 to build 186 miles of line, 370 members in Briscoe, Hall, Motley, Donley, Childress and Collingsworth counties. Dickens County Electric Cooperative, Inc., Spur, Joe M. Rose, president, $179,000 to build 255 miles of line, 500 members in Dickens, Kent, Stonewall and Motley counties.

Among construction contracts approved between October 2 and October 24 are the following:

ALABAMA—Tombigbee Electric Cooperative, Sulligent, Ora E. Beasley, supt., and Gordon Persons and Co., Montgomery, Ala., engineer, contract to Stuart C. Irby Co., Jackson, Miss., 450.6 miles of line, 1,081 members; bid, $270,203.

GEORGIA—The Walton Electric Membership Corp., Monroe, John L. Snow, supt., and J. B. McCrary Engineering Corp., 1408-22 Marietta Street Bldg., Atlanta, Ga., engineer, contract to Shely Construction Co., P.O. Box 398, Lexington, Ky., 160 miles of line, 584 members; bid, $113,802.

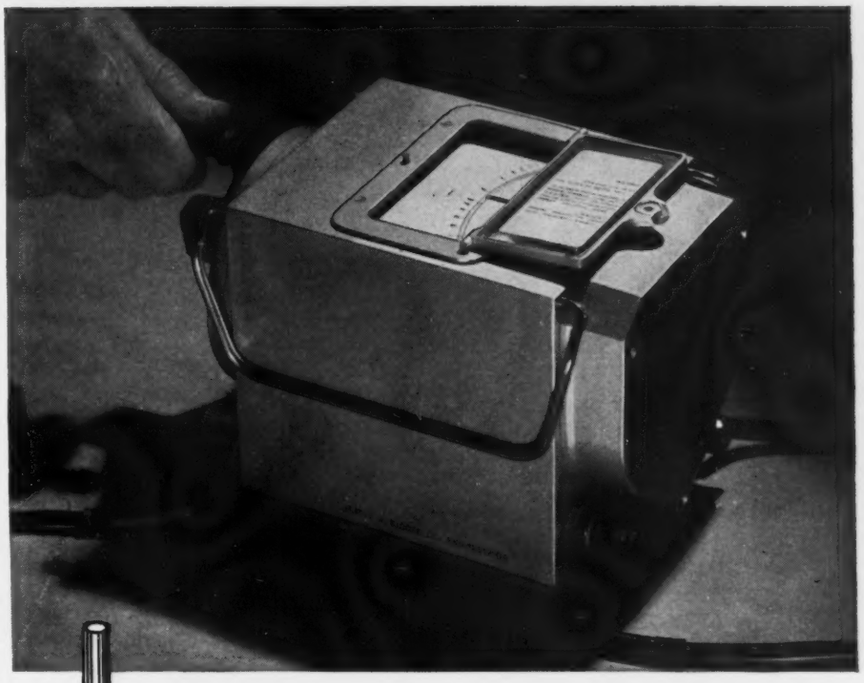
IOWA—The Cooperative Electric Co. of Osage, St. Ansgar, Louis J. Vandermyde, supt., and Stanley Engineering Co., Muscatine, Iowa, engineer, contract to Eberhard Construction Co., Guttenberg, Iowa, 147.5 miles of line, 263 members; bid, $103,146. Woodbury County Rural Electric Cooperative Assn., Moville, Dale Schriener, supt., and Buell and Winter Engineering Co., 508 Insurance Exchange Bldg., Sioux City, Iowa, engineer, contract to Evans Construction Co., Early, Iowa, 151 miles of line, 258 members; bid, $104,222. Allamakee-Clayton Electric Cooperative, Inc., Postville, Kermit M. James, supt., and K. R. Brown, Valley Bank Bldg., Des Moines, Iowa, engineer, contract to Hoak Construction Co., 63rd St. and Ingersoll Ave., Des Moines, Iowa, 439.4 miles of line, 790 members; bid, $346,921.

MINNESOTA—P.K.M. Electric Cooperative, Inc., Warren, O. J. Overmoen, coordinator, and C. J. Hastad, Halstad, Minn., engineer, contract to Megarry Bros., St. Cloud, Minn., 359 miles of line, 641 members; bid, $226,843.

MISSISSIPPI—Delta Electric Power Assn., Greenwood, L. C. Spencer, supt., and Bowman and Bowman, Greenwood, Miss., engineer, contract to Delta Construction Co., Clarksdale, Miss., 208 miles of line, 830 members; bid, $123,839.

OREGON—North Douglas Electric Cooperative, Inc., Roseburg, Robert L. Adams, supt., and John W. Cunningham and Associates, 1112 Spalding Bldg., Portland, Ore., engineer, contract to Tri-State Construction Co., 1812 N. E. 40th Ave., Portland, Ore., 42.3 miles of line; bid, $129,965.

SOUTH CAROLINA—Palmetto Electric Cooperative, Inc., Ridgeland, D. M. Baxter, supt., and J. B. McCrary Engineering Corp., Atlanta, Ga., engineer, contract to Wheatley and Mobley, 718 Reynolds St., Augusta, Ga., 240 miles of line, 640 members; bid, $164,778.



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5. Covers a wide range of resistance.
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8. Has its own hand generator; requires no batteries or other external current supply.
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10. Represents only a small fraction of the cost of adequate grounding protection.

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$1\frac{1}{4}$-$4\frac{1}{2}$ in. PIPE
3 TIMES FASTER

If you bend conduit and pipe with obsolete bending equipment or clumsy makeshift methods, Greenlee Hydraulic Benders can save you as much as 75% in bending time. Greenlee Benders, with their powerful hydraulic units, bend 3 times faster because they're easier for the man on the job to operate. The No. 770 Bender, shown above, has a maximum pressure of 25 tons for bending 1¼ to 3-inch conduit, while the larger No. 775 Bender with a maximum pressure of 40 tons will handle 3 to 4½-inch material. There's also a complete selection of Greenlee hand benders for tubing up to ¾-inch. Write for new S-116 Bender Booklet . . . it'll show you how to save time and money on every bending job.

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- ✓ One man can easily and quickly develop the pressure needed to bend conduit up to 4½ inches.
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- ✓ You eliminate expense and delay of cutting and threading nipples.
- ✓ The smooth, even bends made by Greenlee, eliminate wasted time when pulling in wire.
- ✓ The Greenlee, built in one unit, is easily carried to the job and set up and is easier for operator to handle.

GREENLEE TOOL CO.
1705 Columbia Ave., Rockford, Illinois

Substations by the Dozen Built by Bonneville

[*Continued from page* 64]

the control room proper, a "communication room" with carrier-current panels, inverters and battery charger, a storage battery room, a small kitchenette with sink and electric plate and a storeroom, which often houses the water pump and pressure tank. An office may be included for the chief operator or line patrolman.

A basement is provided where the station is large enough to justify separate terminal cabinets on the floor below the switchboard. At small stations a tunnel only is provided below the switchboards for incoming cables.

Flexibility to take care of future growth is usually provided for by generous dimensions of the control room. At some Bonneville stations it is designed with removable tile walls at either end, so that the switchboard can expand into the storeroom, or communication room, or both. (Other buildings can be built to house these functions.) This is an "out" reserved for unforeseen contingencies, as all anticipated growth can be taken care of in the space provided in the regular control room.

Shop and Storage Facilities

A combination shop and storeroom building has been developed for use at the major substations. This design has been used at Chehalis and Midway and will be used with slight modification at Covington. The plans provide a high central portion with a 125-ton crane suitable for assembling 25,000-kva. transformers or dismantling them for repair. Transformer transfer tracks extend from the yard into the building to permit ready handling. A wing on one side contains a shop, toolroom, and oil-filtering equipment, while a similar wing on the opposite side provides a storeroom with unloading platform.

It has been found completely feasible to adopt a single standard width of panel (24 in.) and to control from one to three circuits from each panel, depending on the amount of equipment involved. To date there has been no occasion for the use of miniature equipment. Mimic buses are used on all boards.

Terminal cabinets have gone through a considerable evolution. Those first provided consisted of rows

QUIT STABBING POLES

● Use the new Multipoint Cant Hook. Its 6 points, ¼ in. x ½ in. in size, hold better than a single long point. Leave no deep stab holes where water collects and rot starts—do not damage the creosote treatment. The Multipoint Cant Hook grips more securely even the smallest diameter poles which are so difficult to handle with the standard single point hook—spreads strain over wider area—is self-releasing. Furnished in 3 sizes for handling poles up to 22 inches in diameter. Multipoint speeds up pole handling in the yard—eliminates damage—saves time and money. Made by the American Fork & Hoe Company, Cleveland, Ohio.

STURDETOOLS
a TRUE TEMPER PRODUCT

MULTIPOINT CANT HOOK
6 points ¼"x½" in size grip the pole securely but leave no deep hole to encourage rot and decay.
Furnished in small, medium and large sizes for handling poles up to 22" in diameter. Prices and complete description on request.

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and tiers of steel cabinets with hinged doors. Later, 24-in. steel panels very similar to the corresponding switchboard panels on the floor above were used. Like the switchboard panels, they were placed back-to-back, 6 ft. apart, with steel doors closing the resulting aisle at either end. Horizontal steel straps were welded in place at intervals across the back of each panel, for mounting terminal blocks and for lacing cable.

The above two schemes were found somewhat unhandy to wire during the initial construction. The new standard is similar to the second scheme, except that an open vertical rack or frame is first built of light steel angles, to which terminal blocks are screwed and cables laced. After this work is complete steel panels are bolted to the rack to close in the wiring.

•

Municipal Plants

ARCADIA, FLA.—Citizens, in a special referendum held recently, voted 446 to 112 a charter amendment permitting the city to own and operate its own light plant.

CAPITAN, N. MEX.—New Mexico Public Service Commission recently approved sale of the Lincoln Power & Light Co.'s plant to the village. Commission Chairman G. S. Carter said the plant was sold for $36,500. The village plans to issue revenue bonds totaling $45,000 to cover the purchase price and create a reserve for additions, extensions and improvements. "The bondholders," said a commission announcement, "will not be given a mortgage by the village, nor will they have any recourse on the village involving raising of taxes for the purpose of meeting any bond default. Their only recourse will be the revenues from the plant."

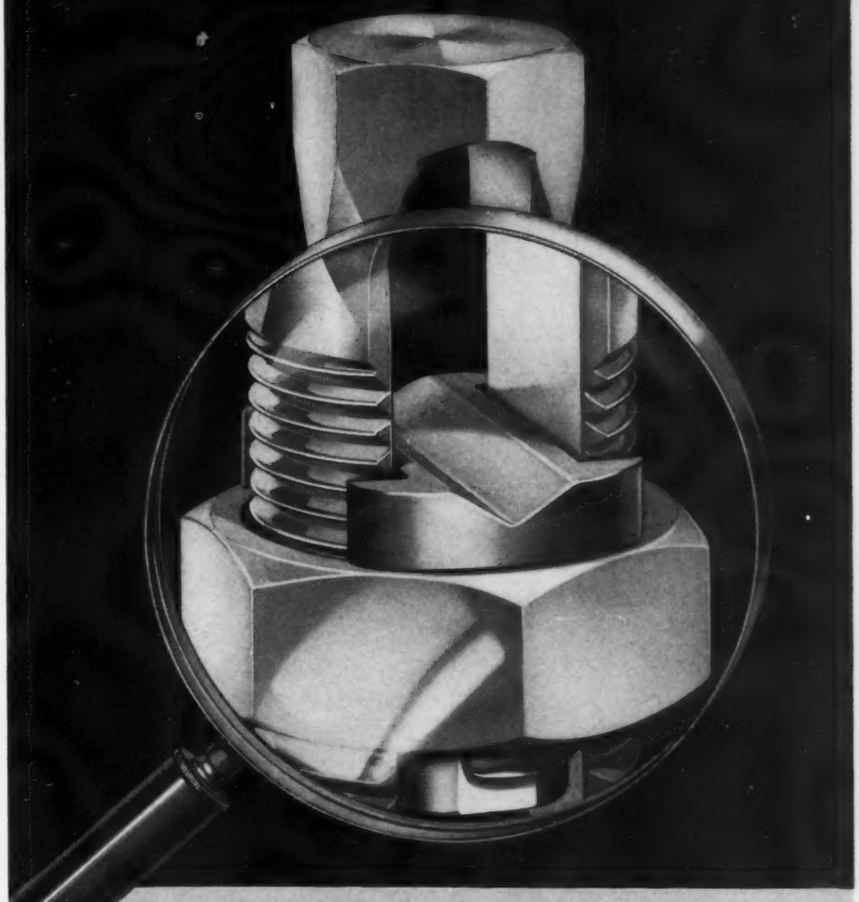
WATERLOO, WIS. — Village has been granted authority by Wisconsin Public Service Commission to establish a municipal electric generating plant at a cost of about $104,000. Wisconsin Gas & Electric Co. now furnishes most of the power used in the village, but the municipality's officials recently decided to generate their own current.

•

Drill Standardization

Standardization of portable electric drills, except the high-tension type, is provided for in Commercial Standard CS93-41, made public by the National Bureau of Standards, according to the Department of Commerce. The standard provides minimum specifications for Class A, heavy duty, and Class B standard, rotary electric drills, manufactured in eleven standard sizes ranging from $\frac{1}{8}$ in. to $1\frac{1}{2}$ in. The standard became effective for new production on October 18.

The Secret Of High Pressure Contact At Low Wrench Torque



Look closely at the clean-cut threads on any L-M High Strength Connector, run your fingers over their keen, smooth edges . . . right there you have the "secret" of efficient L-M threads, of high pressure contact at low wrench torque. Threads on both nut and body of L-M High Strength Connectors are machined with the same precise care. High Strength alloys make both the nut and body rugged, immune to years of "weathering". That is why L-M High Strength Connectors give you perfect, permanent conductor contacts, even after years of repeat use. Specify L-M in your next connector order.

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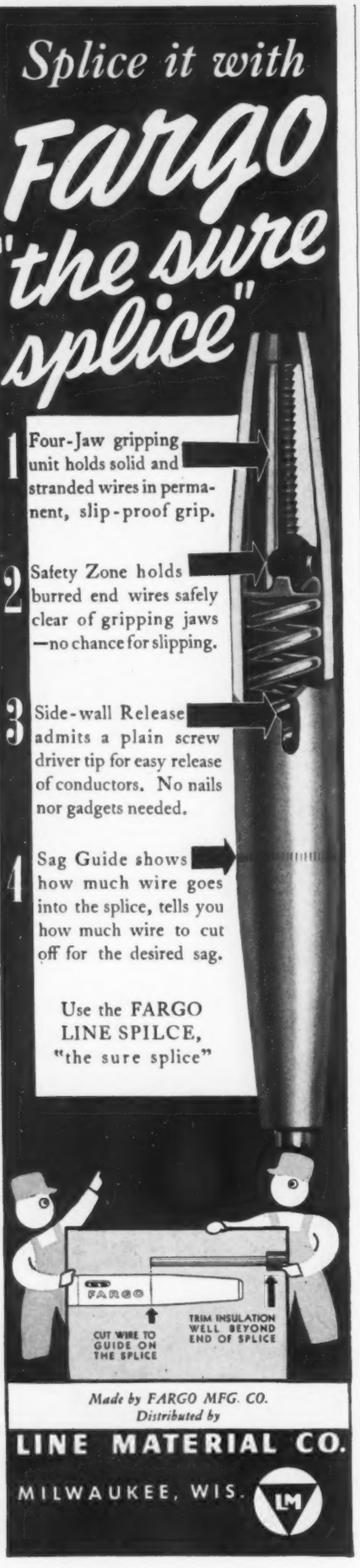
Splice it with
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"the sure splice"
1 Four-Jaw gripping unit holds solid and stranded wires in permanent, slip-proof grip.
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3 Side-wall Release admits a plain screw driver tip for easy release of conductors. No nails nor gadgets needed.
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Use the FARGO LINE SPILCE, "the sure splice"
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Made by FARGO MFG. CO.
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Vast Power Resource Lies Unused

[*Continued from page 53*]

power for electro-metallurgical productions which have been so widely publicized and have been used as evidence to support claims of present or impending power shortages. There is no reason why these uses of energy popularly considered as continuous may not be fitted into plans for employment of off-peak power. Such processes should in some cases be amenable to power supply conditions of less than 100 percent continuity. And with revision of industrial working habits large blocks of 100 percent continuous power can be released for processes requiring such supply.

Perhaps More

Two concluding observations seem to be indicated.

The first is that throughout this discussion the definition of off-peak power is taken as that which is available for 95 percent of the hours in the year. It is thus implied that off-peak power has or can have no more liberal definition. This is not the case. Actually contracts for power for aluminum and other electro-process production, specifying power of 90 percent availability, have been in satisfactory operation for many years. To apply this lower figure of availability is to increase the estimate of off-peak power.

The second observation is for emphasis. This discussion deals solely with energy production capacity used to carry load. The resource of off-peak power here asserted in millions of kilowatts does not infringe upon the area of reserve capacity which is held as service insurance for protection against failure of energy supply to all customers, off-peak customers included. The matter of reserve capacity, up to this paragraph, was deliberately, intentionally, excluded from discussion. To have included it would have been to introduce many unnecessary complications into the development of the theme. According to some opinions reserve capacity in large or small part should be available for off-peak energy production. Thus its exclusion from this discussion is evidence for the conservatism of the statements made here in estimation of our national resource in off-peak power.

The factors that will operate to reduce availability of off-peak power have not been skipped over lightly in this article. Possibly the sincere effort to present them fairly has given them such prominence as seriously to vitiate the startling assertions of the opening paragraph—5,000,000 kw., 40,000,000,000 kw.-hr., thousands of planes, saving of scarce metals, etc. Possibly these claims are too big. And they may be too small. But that a reservoir of off-peak power does exist will be admitted by all who have knowledge of the business of electricity supply. How much it amounts to and how much of it can be used are at this time matters of opinion only. Data to justify rigorous estimates in national terms have not been collected by any agency. Until such data have been brought together, analyzed and integrated to reach an arithmetical result, the only possible statement of off-peak power availability is of the kind made here. And, after all, it is less important to figure out to a gnat's heel or even to an elephant's foot how much off-peak power is available than it is to start putting it to work. We know there is a lot of power waiting to be used. Let's start using it.

Can Off-Peak Power Be Used in Chemical Industries

[*Continued from page 53*]

the cells. The heat supplied to the cells is partly electrical and partly fuel. It would appear to be a not too difficult problem when serving the cells with off-peak power to increase the fuel heat during periods of somewhat reduced electric energy supply.

The electrochemical process for aluminum is very similar to that for magnesium. But the heat supplied is at present entirely electrical, based on the ohmic resistance of the fused fluoride electrolyte. May it not be possible so to change the operation of the aluminum cell as to include heating partly by fuel? We grant that the application of this auxiliary heat must be preferably applied to the sides of the aluminum cell instead of to the bottom of the cell, as in the case of the magnesium cell, since aluminum metal collects below the melt, whereas magnesium metal rises to the top of the melt. We fully appreciate that overheating of the aluminum metal in the both results in low cur-

rent efficiencies due to "fog" formation. But we feel certain that this can be avoided through proper cell design and operation.

Considering that 1,000,000 kw. of off-peak electricity can be translated into almost 800,000,000 lb. of aluminum metal per year, it certainly seems that the possibility of immediately available power for this purpose should be thoroughly explored.

Electric Steel

When we come to the production in the arc furnace of electric steel and the all-important defense alloys of ferrosilicon, ferrochrome, ferrotungsten, and others, the application of off-peak power presents less of a problem than in the case of aluminum metal and magnesium metal production. As a matter of fact, off-peak service to electric arc furnaces for metal melting has been used for many years. The operation of the arc furnace is not continuous. It is a batch process. There should be no difficulty in keeping furnace demands out of the periods of electricity system peak loads.

Whereas the power demands of the electrolytic copper industry, and other industries based on the electrolysis of water solutions, are relatively small when compared with the demands for the production of aluminum or of ferrochrome, yet even in these cases there is a field for off-peak power. Thus, the electrolytic copper industry has for years been varying its cell current in response to market trends. Pure copper acceptable to the electric industry can be produced at a current density of 10 amp. per square foot as well as at 25 amp. per square foot.

These few examples suffice to indicate the applicability of off-peak electricity to electrochemical industries. Other interesting examples might be included. As Mr. Innes correctly comments in his article, the usefulness of off-peak power will depend upon the effort made to realize it.

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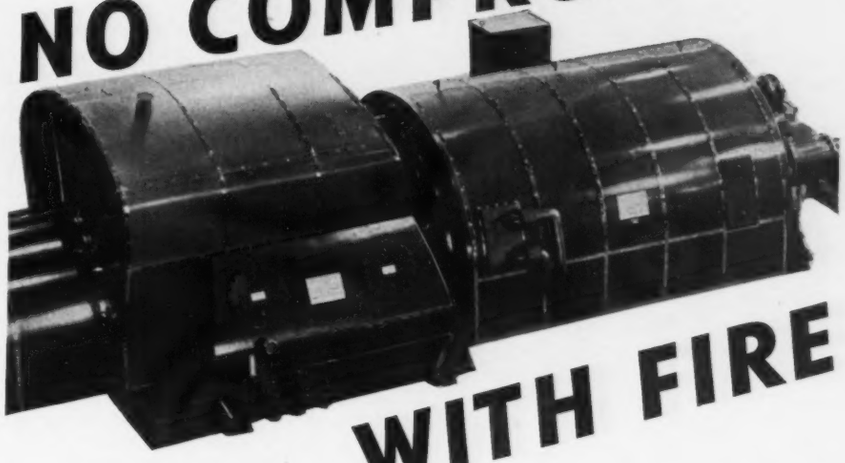
Issues New Magazine

Articles discussing use of instruments in industrial applications will be featured in a new monthly house magazine, "Wheelco Comments," launched recently by Wheelco Instruments Co., Chicago.

NO COMPROMISE WITH FIRE



The defense emergency calls for more and more power, and that demand may well mean new equipment. Not a moment's cut-out; not a second lost in change over, calls for positive fire protection for all out power. C-O-TWO* gives you maximum fire protection, continuously. For years C-O-TWO Automatic systems have protected many of the nation's largest generators, transformers and other equipment.

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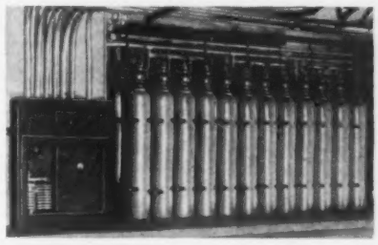

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Sales Opportunities

CHICAGO, ILL.—Commonwealth Edison Co. plans one-story and basement addition to terminal power substation at 3501 South Pulaski Road. Work is scheduled to begin soon.

MIDDLETOWN, PA.—Purchasing and Contracting Officer, United States Air Corps, Middletown Air Depot, receives bids until November 24 for 547,000 lineal ft. of rubber-covered wire, 40,000 ft. of bare copper cable, 20,000 ft. of lead-covered cable, 17,200 conduit reducers, 38,000 conduit bushings, quantity of condulets, flush connectors, conduit locknuts, polarized connectors and other equipment (Circular 562 AC 42-5).

OMAHA, NEB.—Nebraska Power Co., Omaha, plans extensions in transmission lines in parts of Douglas and Colfax counties. Permission has been secured. Proposed to begin work soon.

KANSAS CITY, MO.—Corn Products Refining Co., 1001 Bedford Street, North Kansas City, manufacturer of starch, dextrine, etc., plans installation of motors and controls, switchgear, duct lines, conveyors and other power equipment in new additions to local mill, comprising several processing and production units for about 40 percent increase in present capacity. Also will expand power plant, with installation of new 4,000-kw. turbine-generator unit and accessories, two boilers with rating of about 65,000 lb. of steam per hour, and miscellaneous equipment. Entire project is reported to cost over $2,000,000. Work is scheduled to be carried out at once. Main offices of company are at 17 Battery Place, New York, N. Y.

LONG BEACH, CALIF.—Department of Public Service, George E. Baker, director, has plans under way for installation of improved street-lighting system on Pacific Coast Highway, extending from East to West city limits. Cost estimated close to $150,000.

TACOMA, WASH.—Board of Contracts and Awards, City Hall, receives bids until November 24 for primary equipment for proposed new municipal hydroelectric generating stations on Nisqually River, including one 55,000-hp. hydraulic turbine and one 40,000-kw. electric generator, for La Grande dam power station; and for two 34,500-hp. hydraulic turbines and two 25,000-kw. electric generating units for Alder power station. This is part of a development estimated to cost about $10,000,000, including transmission lines, power substations and other facilities.

DETROIT, MICH.—Briggs Manufacturing Co., 11631 Mack Avenue, manufacturer of automobile bodies, etc., plans installation of motor-generator sets, motors and controls, transformers and accessories, duct lines, fluorescent lighting system, conveyors, electric hoists and other equipment in new plant at Outer Drive and Mount Elliott Avenue, totaling about 450,000 sq. ft. of floor space, for production of aircraft gun turrets for government. A power substation will be located at plant site for central station service. Entire project is estimated to cost about $8,848,000, and funds in that amount will be furnished by Defense Plant Corporation, Washington, D. C., a federal agency, for land, buildings, machinery and equipment. Work will be placed under way at early date.

RUSH SPRINGS, OKLA.—Midwestern Engineering Co., McBirney Building, Tulsa, Okla., consulting engineer, will make surveys and plans for new steam-electric generating station to be constructed at or near Rush Springs by a new electric cooperative organization, now being formed to furnish power supply to a number of electric distribution cooperative associations in Southwestern part of State. Station will be equipped for an initial capacity of about 22,000-kw. Project will include transmission lines to different districts to be served, terminal power substations and other operating facilities. Cost estimated about $2,300,000. Financing will be arranged through federal aid.

JAMESTOWN, N. Y.—Municipal Electric Department plans new indoor-type power substation on Harrison Street, with transmission line to that point from municipal electric power plant at 136 Steele Street. Cost reported over $50,000.

WEST NEWTON, MASS.—Zenith Products, Inc., 58 Chestnut Street, West Newton, manufacturer of pumping machinery and allied specialties, plans installation of motors and controls, switchgear, regulators, duct lines, conveyors, electric hoists and other equipment in new one-story plant in Allston Park district, Nonantum, Mass., for production of hydraulic pumps and parts for government. Plant will be of windowless-type, equipped throughout with a fluorescent lighting system; an air-conditioning system will be installed. Cost estimated about $500,000. Fund in that amount will be furnished by Defense Plant Corporation, Washington, D. C., a federal agency, for project. Work is scheduled to begin soon.

DECORAH, IOWA—Interstate Power Co., Dubuque, Iowa, plans new power substation and switching station at Decorah, in connection with extensions in transmission and distributing lines in that district. Company is reported to be planning new steam-electric generating station for standby service in same area. Entire project is estimated to cost close to $1,000,000. This will be part of 1942 expansion and improvement program.

LITTLEFIELD, TEX.—City Council has plans under way for new municipal electric power plant and electrical distribution system. Cost estimated at $275,000, and bond issue has been authorized in that amount for project. Proposed to carry out work soon.

FARMVILLE, VA.—Virginia Public Service Co., Alexandria, Va., plans rebuilding of portion of auxiliary steam-electric generating station at Farmville, recently destroyed by fire. Loss reported close to $250,000, with equipment.

•

32,000 Visit G.E. House

General Electric Home Bureau's "House of Ideas" in Southport, Conn., near the busy defense factory city of Bridgeport, completed a successful month during which it served as a laboratory of defense housing for 32,000 visitors.

Commercial Cooking Sold to Stay Sold

[*Continued from page 66*]

With the increase in the commercial cooking equipment installations, as well as other items, the supply houses now have salesmen with residences in the service center of our area. They do not, however, have display floors. For this reason the company has maintained displays at various central points. These displays have been supplemented for the past five years with a traveling coach display.

Sales and Service

Each fall a trip is made throughout the property and this coach is taken directly to the customer's door for his inspection. Not only are the restaurant owners invited to view the display, but cooks and waiters are also urged to look at the equipment. The story told in these interviews is, first, of the need for this type of cooking in terms of the customer's present equipment and cooking additions. It is then pointed out that electricity can advantageously fill the need for a different method of cooking. This is attested to by indorsements from various present users within the territory. The display is then shown as the equipment which will advantageously translate electricity into better and more profitable cooking results.

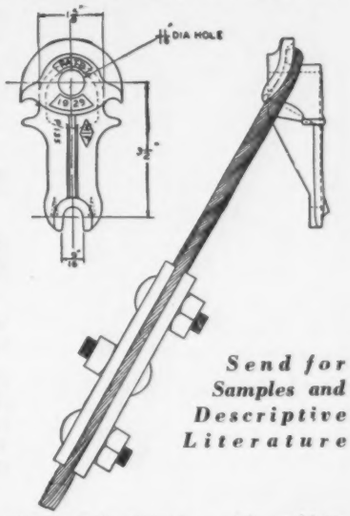
The coach is accompanied by a commercial salesman, who tells the story of electric service and appliance servicing. The supply house salesman, who also accompanies the coach, explains the advantages of his particular make of equipment.

In addition to this coach, commercial cooking schools have been held which are presided over by men expert not only in the knowledge of electrical equipment but in the various intricacies of cooking technique. These schools have been very successful and very well attended.

Other sales aids include a sales manual. This sales manual is used not only by the commercial salesmen but also by local managers in the various towns. As the local manager is not thoroughly conversant with all the advantages of electric cooking, he is supplied with information designed to secure the customer's interest and to lay the groundwork for follow-up sales and service calls by the commercial salesman. This

Simplified Guying Specifications

A new circular available on request features suggestions for Simplified Guying Specifications based on three simple galvanized malleable castings — M.I.F. P135 Through-bolt Guy Hook as illustrated, P128 Thimbleless Eye Nut, and P143 Curved Ribbed Washer — which users definitely rate equivalent to standard ⅝" bolts and guy strands with which they are used. A logical starting-point for Through-bolt Guying is provided when a ⅝" through-bolt constitutes the means for applying corner or dead-ending stresses against which pole must be guyed — then, using suitable attachment on other end of same bolt.



Test competitively with present guying specifications by sending assorted trial order at following 100-lot F.O.B. Branford prices:

P135 Guy Hook . . . $18.20/C	P126B Bolt Eye . . . $24.50/C
P128 Eye Nut 14.70/C	PA128-6 Anchor Rod 66.70/C
P143 Curved Washer 7.70/C	(⅝" x 6 ft. Thimbleless)

Or, we will send sample P135, P128, and P143 without charge or obligation in response to request on Operating Company letterhead.

Use the Guy Hook for anchor guys, and the Eye Nut or Bolt Eye for pole to pole and other relatively flat guys, and the Curved Washer to minimize slotting or splitting stresses in the pole. Larger sizes available for heavier service. More than 1,000,000 successful M.I.F. Guy Hook installations prove these specifications are practical.

Send for Samples and Descriptive Literature

Misc. M.I.F. Pole Hardware Specialties: — *Williams Pole Mounts — Pole Stubbing Clamps — Aerial Cable Messenger Clamps and Insulated Hangers — Malleable Secondary Racks and Clevises — Tubular Pole Fittings — Transformer Hanger Plates for Through-bolt Mounting — Malleable Crossarm Gains — Screw Anchors — Sidewalk Guy Fixtures and Alley Arm Braces — Guy Strand Dispensing Holders — Through-bolts and Double-arming Bolts, etc.*

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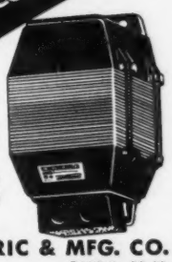

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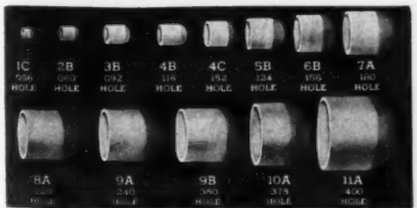
Acme ACME Electric



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Use Lavolain ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U. S. A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.

STAR PORCELAIN CO.
TRENTON, N. J.

sales manual is supplemented by the monthly sales training course which is on new developments as well as a review of the advantages of electric cooking.

Whatever success has been attained in sales and servicing must be accredited to a large extent to the following factors:

1. A carefully selected and trained organization which is constantly informing itself on the many methods of cooking and maintains a check-up on installations.

2. Effective and aggressive cooperation with hotel restaurant supply houses.

3. Cooperation with manufacturers in promotional enterprises and in the development of new equipment.

4. Cooperation from local managers and other employees of the company who are personally acquainted with the restaurant owner.

Commercial cooking load is not gravity business in the territory served by the Idaho Power Company. It is the result of the effective cooperation of the above four-mentioned groups. The value of the commercial cooking load lies not only in the revenue produced, but the use of commercial cooking equipment improves the load factor of the customer, which results in an improvement of the system load factor. Lower kilowatt-hour costs are carried to the customer by properly designed load factor rates.

The following tabulation of 125 commercial cooking installations recently surveyed gives an idea of the range of connected loads sold to food-serving establishments:

Kw. Connected	No. of Establishments	Kw. Connected	No. of Establishments
0 to 9	17	35 to 39	4
10 to 14	20	40 to 44	5
15 to 19	22	45 to 49	5
20 to 24	18	50 to 74	11
25 to 29	15	75 and over	3
30 to 34	5		

Will Get Standby Power

California Railroad Commission has authorized the Pacific Gas & Electric Co. to construct a new 110,000-volt power line to furnish the Mare Island Navy Yard and Vallejo with standby service in case of a breakdown of the government's facilities. The new line will be owned by the federal government, but will be operated by Pacific Gas & Electric.

No Interruptions!

TODAY, power failures may be more than inconvenient; they may actually endanger the Nation's safety, for most defense plants stake their deliveries on uninterrupted current. Knowing that insulation is a vital link in rendering continuous service, utilities are standardizing more and more on Acme Varnished Tapes . . . nationally known for high dielectric, superior strength, and the good stretch needed for snug fits. Samples on request.

Acme Wire Products
VARNISHED INSULATIONS — MAGNET WIRE COILS

for a Faster, Better Job, Use

Sherman Wedge Grip Connectors

1. Special insert plate for greater thread strength.

2. V-shaped corrugations that grip wires securely.

3. Headless bronze screw, non-removable, with oval point. Easy to tape.

4. Exclusive patented Sherman design.

Sherman wedge-grip connectors have won a host of friends because they save time, save trouble and insure a permanently dependable joint.

Find out about these wedge-grip connectors with the exclusive Sherman features. Find out about the many other popular electrical specialties in the Sherman line. Write today for the new catalog of Sherman electrical goods which gives full specifications and list prices.

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

Austin Purchases Unit from Walker Electrical

Announcement has been made that the M. B. Austin Co. of Chicago has purchased the outlet and switch box section of the Walker Electrical Co., Atlanta, Ga. This includes all the machinery, tools and dies required in the manufacture of the Walker line of outlet boxes and covers, switch boxes and bar hangers. The Walker production will be added to the normal Austin production in an attempt to meet the increasing demand for this class of material brought about by national defense needs.

The Walker plant will immediately be moved to Northbrook, Ill., where Austin is building its new manufacturing unit. Production is expected to start shortly after the first of the year.

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Ordnance Plant Contract

Constructing Quartermaster, U. S. Army, Parsons, Kan., has awarded a contract to Evans Electrical Construction Co., Kansas City, Mo., on a cost-plus-fixed-fee basis for interior electrical work for new local ordnance plant, to be used for production of equipment for War Department. The contract is estimated to total $950,000. Work on project is being placed under way, with completion scheduled in 1942. Plant will represent a total investment of $27,000,000 and will be operated by J-M Service Co., Inc., New York, N. Y., recently organized subsidiary of Johns-Manville Corp.

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Defers Plant Erection

Columbia Electric Manufacturing Co., Cleveland, Ohio, will hold in indefinite abeyance plans for proposed one-story addition to plant (ELECTRICAL WORLD, October 18, page 165). An existing three-story building of about 25,000 sq.ft. of floor space will be remodeled and improved for early occupancy, as initially planned.

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Large Trailer Order

The War Department has ordered 1,028 one-ton cargo trailers at a cost of approximately $225,000 from the Nash-Kelvinator Co. The contract is another resulting from the drive to spread defense work into plants hard hit by priorities curtailment. The trailers will be built in the company's Kenosha and Racine plants, where autos and commercial trailers are normal products.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT
BUSINESS : : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

10 CENTS A WORD. MINIMUM CHARGE $2.00
Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by 10 A. M. Monday will appear in Saturday's issue, subject to limitations of space available.

POSITIONS VACANT

DRAFTSMEN: Electrical, experienced generating station and substation. Location New York City. State experience and salary desired. P-980, Electrical World, 330 W. 42nd St., New York, N. Y.

ELECTRIC MOTOR TESTER, especially on AC and DC motors and generators. Give full particulars, age, nationality, education, previous experience and salary desired. P-982, Electrical World, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 31 years' recognized standing and reputation carries on preliminary negotiations for positions of the calibre indicated above through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R.W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y.

EXECUTIVES AND TECHNICAL MEN. Qualified candidate desiring $2,500 to $20,000 position may contact employers through our confidential services, established 26 years. The National Business Bourse, 20 W. Jackson Blvd., Chicago.

POSITIONS WANTED

(See also "Selling Opportunity Wanted")

ELECTRICAL ENGINEER, fifty, unmarried, now employed in congenial traveling position; but wishes to change to employment permitting establishment of a home. Thorough training and knowledge of electrical machinery maintenance and operation. Wide experience utility engineering. Recent experience plant electrical engineering layouts. Well read, vigorous, long life expectancy, and able to get along in difficult situations and direct others. History—1912-1917 operation and maintenance of electrical machinery, 1917-1919 U. S. Army, 1919-1920 City Engineering, 1920-1931 from chief draftsman to electrical engineer to first assistant to Engineer, midwest utility, 1931-1934 sickness, 1934-1941 from stationary engineer to maintenance electrician to electrical engineer. Experience spotted; but each time able to learn new professional duties and advance. PW-970, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER, Superintendent, 20 years diversified experience in Utility Operation, including design, Construction and Operation of Power Plants, Substations, Transmission and Distribution. Familiar with accounting and budget procedure. Now employed. Desire change in location. Rocky Mountain or Midwest preferred. PW-972, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

SUB-STATION OPERATOR desires change in employment. 14 years with present employer. A.C. and D.C. experience. PW-975, Electrical World, 330 W. 42nd St., New York, N. Y.

ELECTRICAL ENGINEER. 11 years public utility experience. Relay engineering and application, fuse coordination, automatic control, system studies, power system coordination and operation, Equipment testing; conversant with generating, transmission, distribution and substation equipment. Desire position in utility, industrial or engineering fields, now employed. South or Southeast preferred. PW-981, Electrical World, 330 W. 42nd St., New York, N. Y.

POSITIONS WANTED

ELECTRICIAN—with 25 years experience in installation, testing, and maintenance of relays, industrial control devices, substation and metering equipments—Desires position in the Central or Western states. Married. Available immediately. PW-979, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

BUSINESS OPPORTUNITIY

Wanted Rectifier

Manufacturer interested in securing patent or will assist in development and sale of rectifier for low voltage and high current applications. BO-978, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY WANTED

TWENTY YEARS EXPERIENCE selling electrical jobber — Contractor and industrial trade in Chicago territory. Will handle your line alone or as agent with other non-conflicting lines. RA-983, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

To Employers Who Advertise for Men:

The letters you receive in answer to your advertisements are submitted with the hope of securing the position offered.

Frequently, when, there are many applicants, the only letters acknowledged are those of promising candidates. Others receive no indication that their letters have even been received, much less given consideration. These men often become discouraged, will not respond to future advertisements and even question their bona fide character.

Every Advertisement Printed in the Searchlight Section Is Duly Authorized. Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you merely return the letters of unsuccessful applicants marked, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements.

Departmental Staff

McGRAW-HILL PUBLISHING COMPANY, INC.

"Put Yourself in the Place of the Other Fellow"